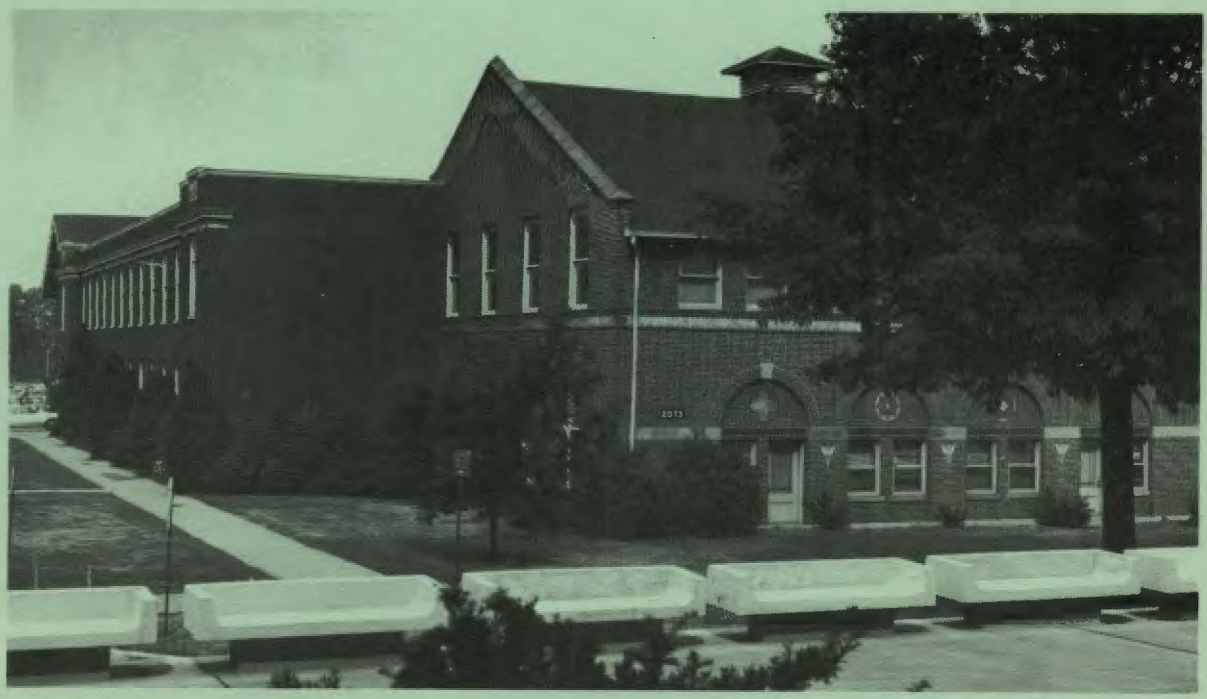
HISTORY OF AGRICULTURAL ENGINEERING
AT
THE OHIO STATE UNIVERSITY

1873-1970

IVES HALL 1926



IVES HALL 1970

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FOREWORD

The initial draft of this History was compiled and written by Mrs. Elizabeth Shaw based on information she obtained and from reports prepared by groups of the current Departmental faculty. Mrs. Shaw and the faculty are to be commended for their contributions.

The work of collecting resource material was organized under the direction of Dr. William H. Johnson. Dr. Floyd Herum as Historian and Archivist (since September 1, 1969) contributed generously in time and effort to complete the History.

Every effort has been made to assure completeness and accuracy but errors in a History of this nature are almost inevitable. We beg your indulgence. We will be pleased to have readers bring omissions and errors to our attention. Such corrections will be useful for subsequent revisions and editions.

Gordon L. Nelson, Chairman
Department of Agricultural Engineering
Ives Hall, 1970

H. C. RAMSOWER
1914 - 1920

F. W. IVES
1920 - 1924

G. W. McCUEN
1924 - 1955

R. D. BARDEN
1956 - 1960

R. E. STEWART
1961 - 1968

G. L. NELSON
1969 -

CONTENTS

CHAPTER I

AGRICULTURAL ENGINEERING--THE EARLY YEARS 1870-1914

Agricultural Engineering in the Agriculture Department. The Ohio State University, first called the Ohio Agriculture and Mechanical College, was chartered on May 11, 1870, as the result of the Morrill Act passed by the United States Congress in 1862. With emphasis on agriculture and the mechanic arts, the first ten departments adopted by the trustees included:

1. Agriculture
2. Mechanic Arts
3. Mathematics and Physics
4. General and Applied Chemistry
5. Geology, Mining and Metallurgy
6. Zoology, and Veterinary Science
7. Botany, Horticulture, Vegetable Physiology, etc.
8. English Language and Literature
9. Modern and Ancient Languages
10. Political Economy and Civil Policy

The college opened its doors for the first time on September 17, 1873, to twenty-five students. Of the ten departments, only seven initially offered courses; these seven began with only seven faculty members, one for each department. The first Professor of Agriculture was Dr. Norton S. Townshend, who resigned from the Board of Trustees to accept the position. Two courses were offered in the Department of Agriculture: a four-year course leading to a Bachelor of Science degree and a three-year course designed for those devoting themselves to practical agriculture rather than theoretical. It was expected that the young man who wished to pursue a professional career would complete the four-year course and the one who wished to return to the farm would spend only three years.

In the first catalog of the Ohio Agriculture and Mechanical College, listing admission policies and course outlines for the academic year 1873-1874, a student's program included a study of languages, mathematics, and the sciences for the first two years; in his third year a student selected his particular field of interest. In the Department of Agriculture, this third year program covered a different aspect of agriculture in each of the twelve-week terms. The first term was devoted to Soils and Crops, the third to Orchards and Gardens, and the second to those subjects now listed under Agricultural Engineering, including Tillage, Draining, Irrigation, Roads, Fences, Buildings, Implements, and Machinery. In the fourth year of schooling, students of agriculture studied Domestic Animals and Their Diseases.

Thus, in this first listing of courses in 1873 lies the nucleus of the Department of Agricultural Engineering which was not to come into actual existence until April, 1914. These engineering studies, an integral part of the agricultural program, were added to and changed, but never deleted, in the historical progression of the College of Agriculture.

Not only was the basis of the Agricultural Engineering Department in existence from the beginning of The Ohio State University, but also three of its major divisions were identifiable: Power and Machinery, Soil and Water and Structures. In a detailed listing of the courses offered for 1875-1876, the studies for the second term, listed under "Work of the Farm," included the following:

Tillage: plowing, harrowing, rolling, drilling, sowing, planting, etc.
Drainage: stone drains, tile drains, mole drains, leveling instruments, draining tools, and the manufacture of drain tile.
Irrigation: its value and methods; distribution of sewage.
Farm Roads: their direction, grade, form, and materials.
Fences: material, construction, and cost.
Rural Architecture: farm-houses, barns, stables, sheds, etc.
Farm Machinery: plows, harrows, cultivators, rollers, drills and planters, mowers, reapers, threshers, pumps, wind-mills, etc.

Allen's Book of the Farm was the sole textbook for this course; but the practical experiences were many. The college farm needed many improvements in these early years, and opportunities for tilling, draining, building fences and roads, repairing farm buildings, and irrigating were in abundance. One activity which began in 1875 and continued for several years was draining a six-acre swamp in the south-west part of the farm. A tile drain was laid along the foot of the bank from which the springs issued, separated the springs and the swamp; the water was then carried off, partly by a covered drain and partly by an open ditch, to the Whetstone River. In one year, 1876, the farm superintendent reported that two hundred rods of board fence had been added to the farm. In 1885 and 1886 water pipes for irrigation were laid along the east side of the north garden and connections made with the city water works. An interesting experiment, carried out in 1877-1878, determined the effectiveness of deep plowing. With three-horse teams and single plows, the subsoil plowing was eight inches deep. In comparing conventional plowing with subsoil plowing, higher yields were measured for corn and sugar beets on the deep plowed plots.

The enrollment in the Department of Agriculture began with six students in 1873 and increased to eleven in 1879 with nine or ten students usually enrolled in the program during the first ten years. The college created for agricultural students was not attracting them and it is perhaps significant that the name of the institution was changed in May, 1878, from Ohio Agriculture and Mechanical College to The Ohio State University. In 1883, Professor Townshend noted that after ten years of operation and five consecutive graduations, not a single student had graduated from the Agricultural Department and that the enrollment consisted of a much larger proportion of city pupils than those from the country. His analysis of the problem was that few students coming from country schools could meet the entrance requirements and that even fewer wanted to spend six years beyond Common School in acquiring a scientific education. Dr. Townshend thus proposed a two-year course covering mathematics, geography, physics, chemistry, botany, physiology, mechanics, practical agriculture, and veterinary medicine. Further, a limited number of free scholarships were offered for this course to cover the incidental fee of $15.00 and laboratory fees of $24.00 - $39.00 per year. In the first year, 1883-84, only six students enrolled in this

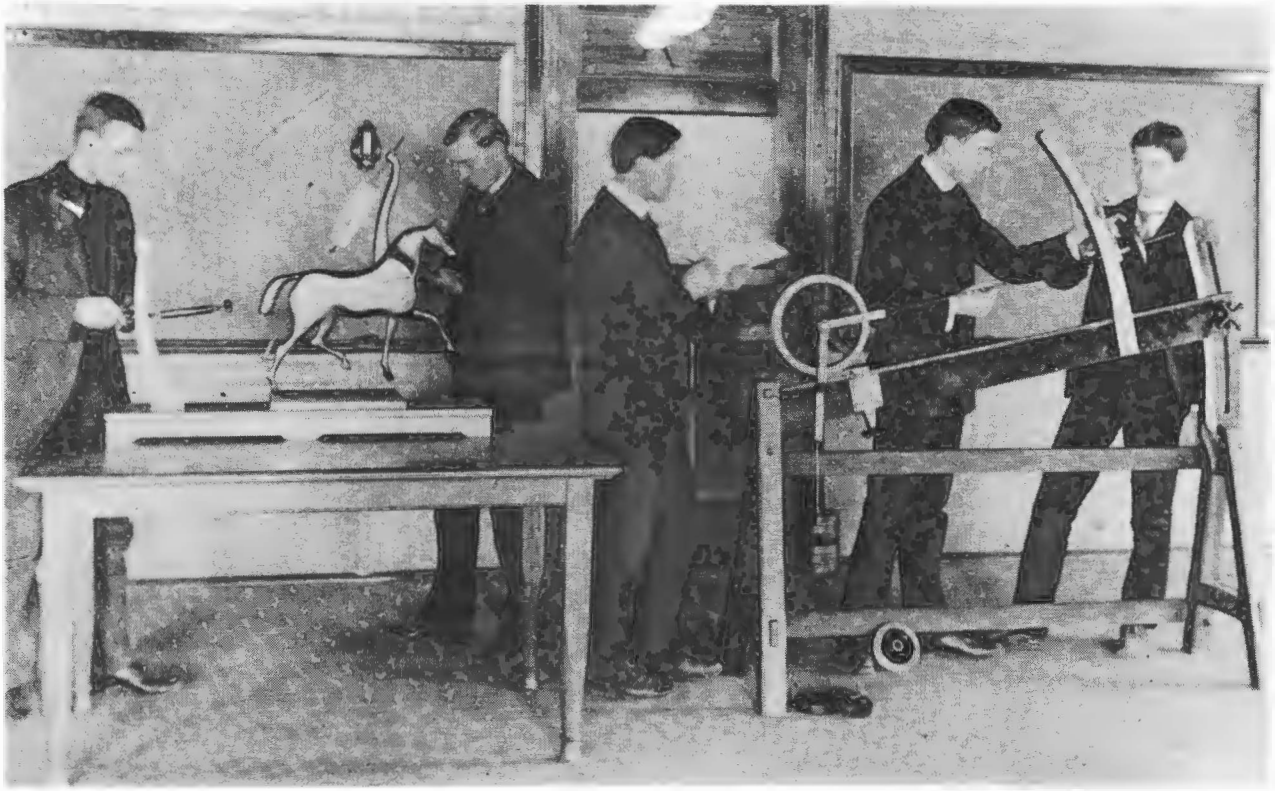
two-year course and fourteen in the regular program. But the next year found sixteen students in the short course. There was a steady enrollment of approximately twenty students per year in these courses up to 1890 when the enrollment jumped to thirty, and then to forty in 1898. The short course had brought the farmer to the classroom.

When Dr. Townshend resigned in 1891, Thomas F. Hunt was elected Professor of Agriculture. He assumed his duties in 1892, coming from a professorship at Pennsylvania State College. By the 1890's, the second term studies in the agricultural program were numbered, and Agriculture II was Farm Equipment with recitations three times a week and enrollment in the high thirties. Some of the special lectures delivered to the students in agriculture included "Why We Drain" and "How to Drain" by W. I. Chamberlain in 1891-92.

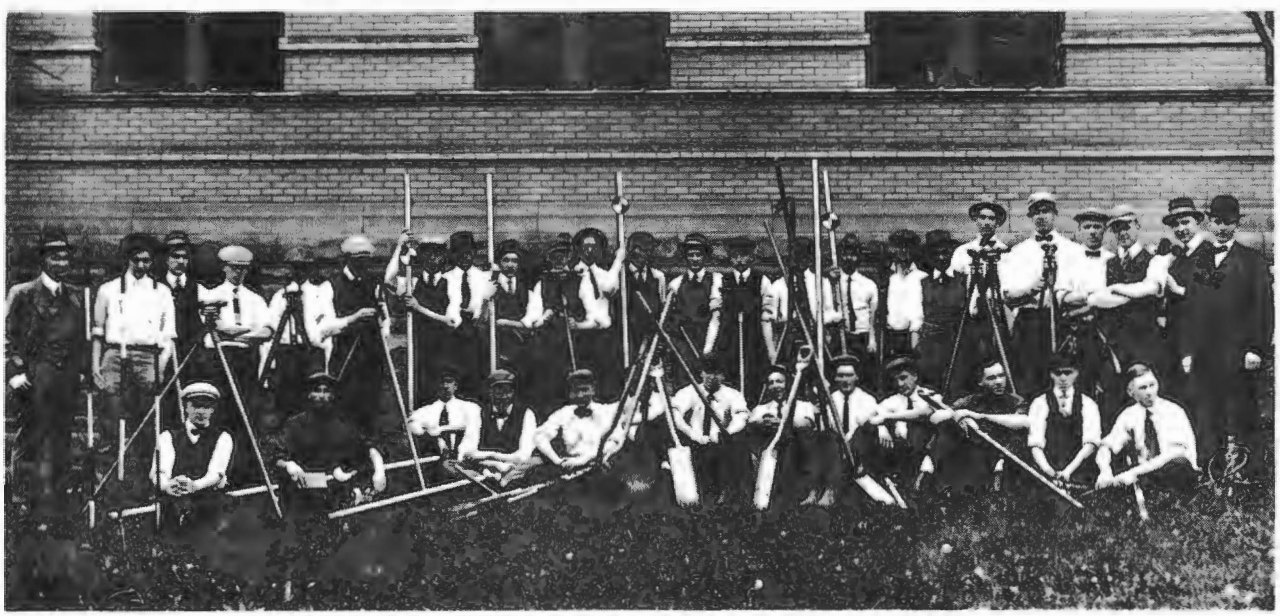
By 1900 there were three divisions in the College of Agriculture: (1) Zootechny and Rural Economics, (2) Agronomy and Farm Equipment, and (3) Dairying. The division of Agronomy and Farm Equipment offered three basic courses: Farm Equipment, Soils, and Crops. All were taught by Professor William D. Gibbs who had been added to the Department of Agriculture in 1895 after completing the M.S. from the University of Illinois and postgraduate work at the University of Wisconsin. Under his guidance the program expanded in 1901 to include a course in Rural Engineering in addition to Farm Equipment. The course work in Rural Engineering emphasized (a) surveying fields and locating farm buildings, (b) planning and constructing farm buildings with timber, brick, concrete and other building materials, and (c) laying out and constructing drainage and irrigation systems. The Farm Equipment course was a general study of farm power, water supply, and farm machinery, with practice in comparing farm machines and in solving problems in draft and other farm mechanics.

In the Agronomy Department. In 1905, the Department of Agronomy was established with offices in Townshend Hall, built in 1897, which also housed the College of Agriculture. Professor Arthur G. McCall, Head of the Department, was in charge of Agronomy 2, Farm Equipment, and Agronomy 4, Rural Engineering. For work in farm equipment and rural engineering the department was supplied with "apparatus for studying the effect of grade, height of obstruction, height of hitch, size of wheel and load on the draft of wagons". Correct methods of constructing and using the doubletree were studied by means of a large, adjustable model. The draft of vehicles and farm implements was studied by means of a self-registering dynamometer. The agricultural machinery laboratory contained many of the latest models of farm machinery, including binders, mowers, plows, cultivators, and gasoline engines. Several drainage levels, an architect's level, and a plane table were provided for student use in mapping, running levels, and laying out drainage systems. A small laboratory provided facilities for studying the use of concrete on the farm. (O.S.U. Bulletin, Vol. XII).

A new member of the Department of Agronomy in the Fall of 1908 was Harry C. Ramsower, Assistant Professor, who took over the farm equipment and agricultural engineering courses at a salary of $80.00 per month. Within three years the emphasis in agricultural engineering had switched from horses to tractors. In the 1911 university catalog, wagons were no longer mentioned in the list of laboratory equipment and were replaced by a 20-horsepower gasoline traction engine, a farmer's auto-delivery wagon,



The effect of hitching on draft is a familiar topic to all agricultural engineers. In 1905, the course in Farm Equipment and Rural Engineering was taught in the Agronomy Department, Townshend Hall, with the apparatus shown above.



Forty students were enrolled in the Drainage Course in 1915. That's Professor Harry Ramsower on the right wearing the "stiff Kady."

and a steam traction engine. And in 1911 the number of courses in agricultural engineering taught by Ramsower had increased to five:

Agronomy 101: Farm Equipment. Lectures on the equipment of the farm, the planning of the farm building, and a detailed study of farm power, water supply, and farm machinery.

Agronomy 102: Agricultural Engineering. Lectures covering (a) leveling and surveying instruments, (b) drainage systems, (c) road building.

Agronomy 103: Farm Equipment. Designed for the two-year course in Agriculture with studies of equipment, buildings, farm power, machinery, water supply, roads, and drainage.

Agronomy 114: Advanced Farm Machinery. Study in assembling and testing grain binders, corn harvesters, mowers, etc.; also efficiency tests of gasoline and steam engines.

Agronomy 121: Farm Architecture. Study of materials used in construction of farm buildings and relative cost of buildings from different materials.

The time had arrived for a separation of engineering from agronomy; in April, 1914, the Department of Agricultural Engineering was created.

CHAPTER 2

AGRICULTURAL ENGINEERING AND THE COLLEGE OF AGRICULTURE 1914-1924

Autonomy and Growth. With the creation of the Agricultural Engineering Department in April, 1914, the teaching staff and the student enrollment both increased, and the curriculum developed. The head of the department, an OSU graduate, was Professor Harry C. Ramsower who had been instrumental in developing the agricultural engineering courses while they were still in the Department of Agronomy. To complete the staff for the first year, Frederick W. Ives was transferred from the Department of Engineering Drawing where he had been an instructor since his appointment in 1910, after receiving his B.S. in Mechanical Engineering from the University of Wisconsin. The enrollment in the courses of 1914-15 totalled 215; 143 students in Farm Machinery and Farm Power, 40 students in Drainage, 28 students in Farm Architecture, and 4 students in a special course in Farm Buildings. In addition, 134 enrolled in the short course in Farm Structures offered under the new three-year curriculum, and an additional 106 enrolled in the eight-week winter course in Farm Engineering. The three-year program, offered for the first time in 1914, replaced the two-year program given since 1883. This constituted a radical departure from the earlier program in which courses had begun in the middle of October and ended in the middle of March, enabling a student to spend some time at the University without interfering with the Fall and Spring work on the farm.

In 1914 expenses for two semesters as a regular student were $386.00, consisting of incidental fees (tuition) of $30.00, room and board of approximately $198.00, books and laboratory fees of $40.00, athletic and military fees of $18.00, and general expenses of $100.00. To defray these expenses many students worked on the University Farm at the rate of 15 to 20 cents per hour. Annual salaries for the staff were $2,000 for Professor Ramsower and $1,600 for Instructor Ives. It might be noted that President William O. Thompson was being paid $7,000.

In 1915 Ives was promoted to Assistant Professor with no change in salary, and Glenn William McCuen, a graduate of the University of Illinois, was employed as an instructor in Agricultural Engineering at $1,200. Under "Agricultural Extension", Virgil Overholt was also added to the staff at a salary of $1,200. As an instructor in Rural Engineering, Mr. Overholt was one of the first agricultural engineers in extension in the United States. The staff had thus doubled in one year. Curricular changes included dividing Farm Machinery and Farm Power into two separate courses, Farm Engineering 101 and Farm Power 107, and adding Concrete Construction, Advanced Farm Machinery, and Special Problems. Enrollment was steady with 133 students in the basic course, Farm Engineering, and as many as 88 students in short courses such as Farm Structures and Farm Machinery.

At the beginning of the third year for the department, 1916, Percival B. Potter, a graduate of Kansas State Agricultural College with a B.S. in Civil Engineering and a B.S. in Agronomy, was added to the teaching staff.

In Agricultural Extension, Richard C. Miller with a B.S. in Agricultural Engineering from Iowa State College was hired as an Instructor. Both Overholt and Miller, extension specialists in these early years, ably augmented the teaching staff from time to time. In the next three years--up to 1920--changes in the faculty included the resignation of R. C. Miller in 1917, the addition of James B. Green to the Extension Service, the temporary absences of Virgil Overholt, Walter Pettit, and Norman Fish for terms of service in the U. S. Army during World War I.

The academic year 1917-18 reflected war-time changes with only 825 students enrolled in the College of Agriculture (half the enrollment of 1916-17). Demand for farm labor was so urgent in the Spring of 1918 that the College of Agriculture agreed to excuse on April 1 all students who were in good standing and to allow them half a semester's credit for the work. The effects in Agricultural Engineering can be traced through the enrollment in one course. In Farm Engineering 101, the enrollment for the first semester of 1916-17 was 104; for the second semester, it was 77 students. In 1917-18 the course was offered only in the second semester to 41 students, and in the Fall semester of 1918-19 there were only 18 enrolled in the class. By the second semester of that year, however, the shortage of labor had diminished and 81 were enrolled.

On January 1, 1920, Professor H. C. Ramsower resigned to become Director of the Ohio Agricultural Extension Service, and Professor Frederick W. Ives was named head of the department. Assistant Professor J. B. Green was transferred from the Extension Service to the department to be in charge of field machinery, formerly the responsibility of Ramsower. Mr. Green was replaced by Robert R. Thompson, an alumnus and former student in engineering at the University of Cincinnati.

During the Ives administration (1920-1924) other changes in the teaching, research, and extension staffs included the addition of Wendell P. Miller and Harold P. Twitchell, both extension specialists in agricultural engineering appointed in 1920. R. R. Thompson was transferred to the teaching staff in 1920. Chester O. Reed was appointed in 1922 as assistant professor in agricultural engineering. Some of the student assistants during these years were David Weaver, Edward A. Silver, Everett C. Haughn, Merle S. Klinck, B. Parker Hess, Kenneth C. Sonner, and Israel P. Blauser.

New courses initiated in 1920 were Field Machinery, Dairy Mechanics, Household Equipment, and Household Mechanics. This latter course included laboratory exercises and instruction in soldering, pipe fitting, electrical connections and wiring, belt lacing, rope splicing, painting, use of tools and tool sharpening, cementing and gluing, and meter reading. The House Equipment and Mechanics courses were designed for home economics students; here we see the influence of Professor Ives' wife, Mary A. Ives, who graduated from Ohio State University in 1915 with a degree in home economics. As a Household Equipment Specialist for the Agricultural Engineering Company of Columbus, Mrs. Ives campaigned for the application of engineering principles to the household and its equipment. In addition she gathered information and experimental data covering the mechanical equipment of the household, such as washing machines and vacuum cleaners, in her desire to coordinate the housewife's needs with appliance design. Her engineering abilities were recognized by her election to membership in the Ameri-

can Society of Agricultural Engineers, the first woman to achieve this honor.

A major change in July, 1922, was the replacement of the semester with the quarter system, which necessitated a reorganization and redistribution of courses. The offerings thereafter divided into seven "400" courses: Field Machinery I, Field Machinery II, Plan Reading, Advanced Plan Reading, Farm Motors and Tractors, Farm Utilities, and Household Mechanics; into four "600" courses: Farm Structures, Advanced Farm Power and Power Machinery, Farm Drainage, and Advanced Field Machinery; and one "700" course: Special Problems. With initiation of the quarter plan the three-year Short Courses in Agriculture ended, for now those students who had to help on the farm in the Spring and Summer could receive a college education by attending in the Autumn and Winter quarters. To care for those who could not meet the requirements for the standard course, the eight-week Winter course was broadened in its scope.

In 1923 the Student Branch of ASAE at OSU presented a resolution to the faculty providing that at the end of two additional years work (a six-year course) the student be given the B.S. in Mechanical Engineering and the professional degree of agricultural engineer. Professor Ives in his report to Dean Alfred Vivian, College of Agriculture, for June, 1923, recommended that further provision be made for a professional degree of Agricultural Engineering after completion of approved work following the four-year course. By 1924, the resolution was a fact, with the prerequisites for graduate work being (1) preparation in mathematics through calculus, (2) ten credit hours of mechanics and strength of materials, and (3) a baccalaureate degree in Agriculture with not less than 30 credit hours in agricultural engineering subjects.

During the years following World War I, interest in agricultural engineering increased rapidly. The war had brought about a shortage of labor and work animals, forcing the farmer to look to the tractor for his power. And thus the curious interest in the gasoline traction engines of pre-war days was replaced by an eager demand for mechanical knowledge. During the year 1919-20 a total of 706 students were enrolled in the courses of the department and there was a decided increase in those majoring in agricultural engineering. By 1921-22, the surge of students resulting from the war had passed but yet there were 557 students enrolled in the courses of the Agricultural Engineering Department. One of the recommendations of Chairman Ives in 1923 was that Agricultural Engineering should be recognized as a separate degree-granting entity; this suggestion was not to become a reality until 1935.

The Nomadic Years. A recurring problem throughout these first ten years was housing. At birth, the Department of Agricultural Engineering was provided offices with the parent department, Agronomy, in Townshend Hall. But in 1915 it was moved to the new Horticulture and Forestry Building, farther south on Neil Avenue. The laboratory work in Farm Equipment was conducted in the old Electrical Engineering Building for the first year but likewise shifted in 1915 to the second floor of the Implement Barn, presently Rooms 216 and 217 in Ives Hall. While the laboratory work continued in the Implement Barn, the offices and drafting rooms were transferred in 1917 to the new Home Economics Building, now Campbell Hall. It was during this move that Edna Noble White, Professor of Home Economics, confronted Professor Ramsower and warned him that all engineering students must take care

not to mar the floors in her building. Professor Ramsower replied that as yet there had not been a drafting room in which someone sooner or later had not spilled a bottle of ink and that she should prepare herself for the event. Although the offices were satisfactory, the laboratory facilities were not. In 1919 a lack of heat in the Implement Building caused damage to the equipment and made work impossible at times. A large increase in the number of students in advanced studies during these years made it imperative that conditions be improved.

The request for a building to house agricultural engineering had been approved in the early period of World War I and given precedence over other requests at the time; the war, however, had upset the program. Thus to ease the situation the entire department, both offices and laboratories, was moved to the Aviation Building in 1919 (the present Communications Laboratory) with the second floor of the Implement Barn retained for light field machinery. But the basic problem--poor classroom and laboratory facilities--remained. When the decision was made in 1922 to move the accommodations for the work horses across the river, Professor Ives immediately recommended "that the quarters vacated in the Old Horse Barn be remodeled without delay as laboratories and offices for this Department".

The Fledgling Student Branch. The Student Branch of ASAE at Ohio State was very active in organizing programs and suggesting improvements from its very beginning in 1916. Samuel Philips was its first president. One notable achievement was its handling of the ASAE national exhibit at the Sixth National Tractor Show, held in Columbus on February 11, 1921. (The last of these huge winter shows, sponsored by the National Tractor & Thresher Manufacturers Association, was in 1922. During these seven years of tractor demonstrations and shows farmers everywhere had an opportunity to view all types of tractors and implements). The exhibit included displays from a number of departments of agricultural engineering in the various state colleges, showing the work of these departments. Under the leadership of President A. M. Hedge, the branch members cared for and arranged all the contributed material.

An unique party in the Fall of 1922 was an all-ag-college frolic and wiener roast, led by the Student Branch with B. Parker Hess as President. To provide a fire the engineers hauled eight loads of dry timber from the river bank to the aviation field, using a flatbed wagon coupled to a Samson tractor. The lighted log heap, about three hundred feet long, started the evening.

> "When the fires smoldered, lights were needed and herein lies the feature of the evening. Sixteen-foot uprights were arranged in the form of a U. These uprights placed 20 feet apart in the row carried electric-light wires. Between uprights a light bulb was placed. The electrical-engineering department of the engineering college loaned a 110-volt electric generator. This was mounted on a flat-top hay wagon and hauled to the scene of the folic by a 15-27 Case tractor. Here the Case tractor was bolted to the generator and, when evening came, a continuous flood of white light was produced until after 10:30 p.m." (ASAE Journal, Vol. 3,1922, p.34).

At the Annual "Ag Open Nite" the Student Branch of ASAE presented a stunt entitled "The Universal Household Maid," or the wonderful machine which will do anything. The machine in reality was a large box of beaver board with the simple addition of a motor belted to a large wheel and a few lights to add to its attractiveness.

> "With the machine in operation a sack of flour was placed in the hopper along with some yeast and water and after a few discharges of flashlight powder the red light was turned on and two well-baked loaves of bread were discharged. A collie dog was put in the hopper and after a tremendous amount of racket and grinding about five feet of wiener was discharged at the other end. Two baskets of sawdust were placed in the hopper and there came out at the other end a number of boards, a chair, and various wood products. The machine was also capable of washing, in which all the dirty overalls of the agricultural engineers were run through and clean towels and sheets were discharged. To finish the stunt a number of large firecrackers were set off and the machine exploded and exposed the interior and contents showing the men inside handing out the finished products and what had been going on inside the box." (ASAE Journal, Vol. 3, p. 73, 1922).

In a more serious vein, the students enjoyed several films loaned by tractor companies at the business meetings of the Branch. And, of the several lectures given in 1922 at the Branch meetings, one was by Professor Bear of the Soils Department on lengthening the growing season by drainage and another by Dean Alfred Vivian on "The Modern Farm".

Extension Activities Emerge. Students in agriculture have played important roles in many ways in the history of the university. According to Osman C. Hooper, History of the Ohio State University, Vol. II, 1910-1925, the history of the Agricultural Extension Service in Ohio logically begins with the organization of the Agricultural Students' Union on March 25, 1895.

> "The organizers believed that there was need for a type of service not then performed by an agricultural agency in the state. As the data of the Ohio Agricultural Experiment Station continued to develop and the variety tests at the Ohio State University accumulated, it was felt that the information was not being sufficiently demonstrated. The purpose of the Union was to test varieties, do demonstration work, and give talks when the students could before granges and other agricultural organizations. Soon the work was divided with the Agricultural Experiment Station being in charge of experimentation and the University being in charge of extension". (p. 147).

But efforts to disseminate information had begun sixteen years before this date when the Board of Trustees initiated a course of free lectures on topics of practical interest to farmers. Beginning January 9, 1879, the lectures had continued for four weeks with four or more lectures each day. The experiment was a success with over one hundred farmers registering and around fifty in daily attendance. These annual sessions at the university continued throughout the 1880's, running for three-week periods. This connection between the agricultural community and the university was

further extended by the establishment in 1882 of Farmers' Institutes, which were held in the various counties of the state under the joint management of the Ohio State Board of Agriculture and the University. Through lectures and meetings, the teachers did much to make known the general aim and purposes of the Ohio State University.

Early in 1904, L. H. Goddard of Washington C. H., was employed half-time to organize the development of cooperative experiments at the Experiment Station to demonstrate to farmers the information available to them. On July 1, 1909, the Trustees of the University created the Department of Agricultural Extension, with A. B. Graham as Head. Thus began the development of a staff of subject-matter specialists whose duty was to address groups, give demonstrations, and otherwise assist in the extension work. The final step in the organizing process came in May, 1914, with the Smith-Lever Act in the U. S. Congress providing for cooperation in extension work between the Federal Government and the states. By 1915 the General Assembly of Ohio had accepted the provisions of the act, and work had begun along lines approved by the Trustees and by the U. S. Department of Agriculture.

During this decade requests for an enlarged extension school, with more equipment and instructors than found in the local Farmers' Institutes, induced the renewal at the University of the practical lectures that had originated in 1879. This program, reactivated in 1913 as Farmers' Week, began with a registered attendance of 140 which grew to a peak in 1922 of 6125. These programs, held at the close of the first semester each year, not only brought farmers from all 88 counties to the University but also inspired the professors at the University to continue their research. G. W. McCuen, writing after the conclusion of the twelfth annual Farmers' Week (1924), reported:

> "We have just finished our annual Farmers' Week program and are indeed gratified with the results. Our part (agricultural engineering) of the program was called "A Time and Labor Saving Series". Practically every one of our lectures from the first lecture Monday morning at 9:00 until the last conference at 4:00 Friday afternoon found the lecture room well filled at all hours. It has given us new inspiration and we can now go ahead with our problems in agricultural engineering feeling that the farmer is still vitally interested in machinery of all kinds". (ASAE Journal, Vol. 5, (1924), p.42)

The subjects of practical interest discussed at these meetings are exemplified by some of the lectures given in 1917. Virgil Overholt presented "Running Water in the Farm Home"; H. C. Ramsower discussed "Lighting the Farm Home: Demonstrations of Kerosene, Gasoline and Acetylene Systems"; F. W. Ives addressed the audience on the topic "Hints on Planning the Farm Home"; and W. I. Chamberlain, a guest agricultural writer from Hudson, Ohio, spoke on "Practical Farm Drainage".

One of the most novel of the extension projects was the agricultural train, a special carrying educational agricultural exhibits and a group of instructors from the college who gave popular talks and demonstrations on approved farm practices. For example, one train with which Virgil Overholt traveled in 1920 showed the use of electricity on the farm and in the home. This Home Convenience Special, in cooperation with the New

York Central Railway, made 72 stops in Ohio with an estimated 20,000 persons viewing the demonstrations and hearing the lectures. Most of the trains consisted of a baggage car for the equipment and supplies, a dining car, two lecture cars for adults, and sometimes a special car for boys and girls.

From 1919-1924, drainage demonstrations were an important part of the extension activities. In 1920-21 terracing and earth dams, for soil saving and prevention of erosion, were introduced with far-reaching results. Related work included distribution of war surplus explosives and demonstrations of their use in drainage and land clearing. A new project begun in 1924 was earth road building, an extension activity that would continue for several years.

Although rising costs somewhat limited new construction during 1919-20, the agricultural engineers issued 933 livestock building plans and 199 special plans. In 1923 considerable time was devoted to fruit-storage cellars. And a notable publication of this year was the Extension Bulletin, No. 8, Vol. XVII, "Braced Rafter Barn Framing," by H. P. Twitchell.

Extension activities of these years also embraced tractor demonstrations and tractor tests. The department in 1921 was conducting about forty tractor schools throughout the state during the winter months. Approximately twenty to twenty-five men registered at each school, and farmers who had tractors to overhaul and garage men who were interested in the work cooperated with the department in providing a repair and work experience with accurate instructions.

Initial Departmental Research. In the research efforts of the department in these first ten years, the tractor was the innovation of the day. The upswing in tractor production in the United States during these years is illustrated by comparing the 15,000 units manufactured in 1914 to the 203,207 units manufactured in 1920. Several factors intensified the farmers' interest: a shortage of labor and an increased demand for food production in World War I, the introduction of the smaller, more versatile tractors, and the series of tractor demonstrations held throughout the country.[1] In the early twenties, a post-war agricultural depression lowered the production of tractors and forced the farmer to discontinue his machinery purchases, but the survival of the tractor was never seriously threatened. The Farmers' Week Program at Ohio State in 1919 reflected the topic of the decade. Three of the talks delivered by professors from the department were "How the Power of the Tractor is Measured", by G. W. McCuen; "Hitches and Adjustments for Tractor Drawn Tools" by C. O. Reed; and "Trucks and Tractors" by G. W. McCuen. Visiting speakers included I. W. Dickerson, Agricultural Engineering Editor from Charles City, Iowa, on "Carburetion of Tractor Fuels"; A. P. Yerkes, Agricultural Engineer from Chicago, on "Adapting the Farm to the Tractor"; and F. M. White, Agricultural Engineering Editor from Chicago, on "Can I Afford to Buy a Tractor?"

The Agricultural Engineering Department began conducting tractor tests in 1917, and by continuing them over a number of years gathered much valuable information on tractor performance both in the field and belt connected.

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[1] R. B. Gray, Development of the Agricultural Tractor in the United States. Part I, USDA - Information Series No. 107, June, 1954, p. 24.

Extension work included demonstrations on rural road building back in 1922. That's Virgil Overholt (with arms folded) and Clyde Hooley with the stadia rod. The site is northeastern Washington County.

Student participation was "the thing" in this farm power lab held in the "saw toothed building" in 1922. That's George W. Kreitler on the flywheel. Can you help us name the others?

In July, 1919, the department purchased a Gulley dynamometer and gave it a thorough test; while it was not perfect, it did allow the engineers to collect much better data than previously.

In 1919 a series of tests, conducted at several locations in Ohio by the Agricultural Engineering Department, received national recognition for the information obtained. Tractors pulling plows were tested on various soils: at Akron, the soil was sandy loam, dry and hard, with hidden rocks; at Fostoria, it was a heavy dry loam with hidden rocks; at Middletown the sandy loam had a hard, dry, sub-soil with a wet surface; and at Columbus, the clay loam was hard and dry with a heavy sub-soil. The tractors ranged from the Fordson and the LaCross to the Waterloo-Boy and the Case. (Gray, p. 31).

Articles on these early tractor tests were appearing in various farm magazines. James B. Green covered "Belting" for the Samson Tractor Bulletin in 1917 and "OSU Tractor Tests" for the Farm Implement News in 1920. G. W. McCuen wrote several articles on the tractor tests for the Ohio Farmer.

Other tractor studies were conducted in 1920 by Professor McCuen and Assistant Professor Thomson on a 70 acre plot south of King Avenue. One purpose was to determine the cost of field operation of the tractor and tractor tools; solutions obtained to other problems included the effectiveness of five different types of piston rings, relative cost of tractor operation on three different motor fuels, and the effects of magneto adjustments on the operation of the Fordson tractor.

Professor Ives reported in June, 1922, that $25,000 worth of new machinery had been loaned to the department by implement and tractor concerns; in return for the borrowed machinery much valuable data was turned over to the manufacturers of farm equipment because the farmers of Ohio were the ultimate beneficiaries in improved methods and machinery.

In 1922-23 Professor McCuen designed a new belt power dynamometer with a complete recording device--the first of its kind. It allowed a complete record of time, speed, torque, and load change over a period of ten hours. This dynamometer thus facilitated a study of beltpower requirements of threshing machines, ensilage cutters, etc., as well as their load characteristics under typical field conditions--something that had never been ascertained before. The machine was built by the department. An article relating to these studies appeared in the ASAE Journal in March, 1924, Vol. 5, p. 51--"Some Power Studies Through Use of the Ohio Recording Belt Dynamometer," by G. W. McCuen.

Although the tractor received much attention, other important engineering studies were continuing. One project included several drainage studies conducted jointly with the Ohio Experiment Station to determine the effect of depth and spacing on the efficiency of tile drains. Threshing problems being investigated in the early twenties consisted of developing a successful method of threshing soybeans, in connection with the J. I. Case T. M. Co., and improving the methods for sweet clover threshing. Studies of soybean and corn harvesting were also being initiated at this time.

With the transfer of the farming activities to the west of the Olentangy River, new barns were needed, and Professor Ives designed and supervised the construction of five barns for sheep, swine, horses, beef cattle,

and dairy cattle. During the Spring of 1922, Virgil Overholt substituted for Professor Ives in the departmental work while the barns were under construction. By September the set of buildings, containing interesting experimental features and representing an expenditure of half a million dollars, was completed.

Until 1920, the department of agricultural engineering had concentrated on four more or less distinct lines: farm machinery, farm power, farm structures, and drainage. In the 1920's the department added a fifth area of concern--domestic engineering. Studies were completed on the efficiency of farm light plants, water systems, and labor-saving appliances for the home; much work was done on washing and ironing machines especially.

ASAE Activities and Responsibilities. The members of the agricultural engineering staff at OSU were active during these years in the American Society of Agricultural Engineers. At the fourteenth annual meeting at Chicago (1920), Professor Ives presented a paper, "Psychological Tests for Technical Efficiency in Agricultural Engineering," which showed that while tests are not always conclusive, they are helpful in most cases in predicting success in agricultural engineering. Other early papers published in the ASAE Transactions included "Design of an Agricultural Engineering Building" (1912), "Concrete in Drainage" (1913), "Some Phases of Teaching Agricultural Engineering" (1914), "Demonstrations in Lighting for Farm Homes", (1918) by Professor Ramsower; "Teaching Drawing to Agricultural Students" by Professor Ives in 1917; "Re-Survey of Agricultural Engineering" by Professor McCuen in 1917; and "Opportunities for the Agricultural Engineer in Commercial Work" by Professor Ives in 1921.

In December, 1922, at the 16th annual ASAE meeting, Virgil Overholt presented the paper, "Lessons to be Learned from Failures of Farm Buildings in a Tornado," and F. W. Ives presented "Some New Ideas in Group Planning of Farm Buildings." In the transactions for that year Overholt had an article on the control of soil erosion and Ives was writing on the standardization of agricultural extension.

At the 18th Annual Meeting of the ASAE (June 18-20, 1924) held at Lincoln, Nebraska, the OSU agricultural engineers played dominant roles. Ives was Chairman of the Farm Structures Section, Chairman of the Committee on the Standardization of Blue Print Service, and served on several other committees. G. W. McCuen was Chairman of the Committee on Belt Power Machinery and served on the committee for Tractor Testing and Rating. C. O. Reed was Chairman of the Committee on Teaching Methods. Mary A. Ives and P. B. Potter served on the Committee on Farm Home Equipment. Giving papers at this meeting were Edwin K. Young, a senior student in agricultural engineering at OSU whose topic was "The Spacing of Posts in Barns and Feeding Sheds as Affected by the Turning Radius of Various Vehicles," and G. W. McCuen, whose topic, "Motorizing the Corn Crop in Ohio," was startling and controversial. The election of Frederick W. Ives as President of ASAE for 1924-1925 culminated the events at this meeting.

One week later, as Professor Ives was returning to his home from attending the ASAE meeting and the convention of the Society for the Promotion of Engineering Education which followed, he was seriously injured in a railroad accident near Chicago. He died a few days later, on July 5, 1924.

CHAPTER 3

AGRICULTURAL ENGINEERING MATURES 1924-1945

A national depression and a second world war tested the resourcefulness, ingenuity, and determination of the agricultural engineers during the period 1924-1945. Yet despite a stringent economic situation followed by wartime restrictions, great strides were made in all areas of agricultural engineering: thousands of acres in Ohio were drained and land reclamation projects carried out; the pneumatic rubber tire for tractors made its entrance and the combine became a household word; rural electrification brought new conveniences and labor-saving devices to 180 thousand Ohio farm families; and better dairy barns, poultry houses, and swine sheds were outranked in prestige only by remodeled farm kitchens.

Faculty Growth. During this twenty-one year span, cooperation in the research, extension, and resident instruction of the department was maintained--the teaching staff was called upon in the depression and war years to do much field work while the research and extension people frequently fulfilled teaching duties. Head of the Department of Agricultural Engineering was Professor Glen W. McCuen, who had joined the department in 1915 and who had been named Head of the department after Professor Ives' death. Other department members whose careers coincided with this period were Virgil Overholt, Roderick D. Barden, Chester O. Reed, and Edward A. Silver. Professor Overholt, the first full-time extension engineer, specialized in drainage, erosion control, and irrigation with one-fourth of his time devoted to teaching and the remainder to extension. Professor Barden, employed as an extension specialist in Farm Machinery and Farm Power in 1924, was instrumental in establishing many of the extension programs in the state. Professor Reed, who joined in 1922 as an assistant professor, served as an outstanding teacher and researcher until his death in 1940. Edward A. Silver, employed in 1925 as Research Engineer in Agriculture, remained until 1943 when he joined the Oliver Farm Equipment Company.

The changes in the staff up to 1931 included the resignation in 1924 of Wendell P. Miller (appointed in 1920) to become a consulting engineer in Columbus, the resignation in 1928 of Percival B. Potter (appointed in 1916) who accepted a position in the agricultural engineering department of Virginia Polytechnic Institute, and the resignation in 1928 of Benton M. Stahl who had joined the teaching staff in 1924. Temporary appointments included that of Paul R. Hoff for 1927 and 1928, who worked on machinery while Professor Barden did educational work in corn borer control, that of J. D. Blickle for 1929, serving as Farm Building Specialist while Harold P. Twitchell was studying at the University of Southern California, and that of N. R. Bear for 1927, who conducted sewing machine classes. The latter was given a permanent position in 1930 as extension and research engineer in field machinery and farm power. R. C. Miller, who had been on the staff in 1916-1917, returned to Ohio State from North Dakota Agricultural College in 1930 to head teaching and research in farm structures.

Special positions outside of the department in this period concerned

the Ohio project on the Relation of Electricity to Agriculture; B. Parker Hess was the first Special Investigator for Rural Electrification from 1926 until 1929 when he became a research engineer on the Engineering Experiment Station staff. In 1928, I. P. Blauser left the University of Illinois to accept an appointment as Secretary and Field Engineer for the Ohio project. Although the funds for this project were provided by outside sources including the East Central Division of the National Electric Light Association, these engineers worked closely with the members of the OSU Agricultural Engineering Department.

From 1931-1938 the only two appointments were those of I. P. (Pop) Blauser, who began regular extension work in rural electrification in 1935, and of George R. Shier who assumed extension work in farm buildings in 1936. The depression took its toll in the Extension Service. A reduction in the State budget led to the loss in 1933 of N. R. Bear (extension specialist in farm machinery appointed in 1930) and Harold P. Twitchell (extension specialist in farm buildings appointed in 1920). To compensate for the reduction in staff, R. C. Miller assumed the extension duties in farm buildings during 1933-36 and R. D. Barden was the only extension engineer for farm machinery.

In the last seven years of this period, several new appointments were made. Professor A. C. Kennedy, added in 1939, was principally responsible for teaching vocational agricultural students, but during World War II he taught other courses as needed. Professor William A. Junnila was appointed in 1940 as a research engineer in rural electrification. Assistant Professor Clarence B. Richey joined the teaching staff in 1941. In 1943 three resignations affected the teaching, extension, and research staffs: C. B. Richey resigned to take a position with the Electric Wheel Co., of Quincy, Illinois; George R. Shier (appointed in 1936) resigned to become associated with the Howard S. Sterner Co. of Columbus as Consulting Structural Engineer; and Edward A. Silver (appointed in 1925) left to head up an Agricultural Research Department at the Oliver headquarters in Chicago. One position in the department that saw several changes was that of Instructor in Rural Electrification Safety: LeRoy Albert Ehmsen held it for 1942-43; Dean Horsewood held it for 1943-44; and Chester High was appointed in 1944. A new position created in 1944 was Specialist in Farm and Home Safety, and W. E. Stuckey was appointed to that position. The last appointment in 1944 was that of J. D. Blickle as Farm Building Specialist. Blickle, who left the Extension Service of North Carolina to return to OSU, had temporarily held the same position from 1929-1930 and had then been a graduate student at OSU from 1932-1933.

Some of the other graduate assistants from 1924-1945 included Irwin F. Reed, Harold E. Pinches, Norman W. Wilson, Howard R. Haise, Robert McCall, and Arthur Larson.

Courses and Enrollments. Student enrollment in the Agricultural Engineering Department reflected the misfortunes and the fortunes of the country, maintaining a steady pace in the late twenties, dropping during the depression, soaring in the late thirties, and then diving to new lows in the war years. From 1924-1931 the total enrollment of the University rose from eleven thousand to fifteen thousand with the annual enrollment in the agricultural engineering courses being approximately three hundred students. The years 1931-1935 were difficult with total enrollment dropping to some twelve thousand in 1933-34 and the enrollment in agricultural engineering subjects being fewer than two hundred students. But from 1935-1942 the University's

enrollment rose to eighteen thousand and in 1939-40 the enrollment in agricultural engineering courses was over seven hundred and fifty. The three years at the end of this period saw the University enrollment decrease to ten thousand with only 156 men in the College of Agriculture during 1944-45.

A major change in the agricultural engineering program at Ohio State came in July, 1935, when the Council of Instruction gave its approval for a five-year curriculum. Under this program, the student took his basic agriculture and basic engineering the first four years and fulfilled all the requirements for a degree of Bachelor of Science in Agriculture. During the fifth year his studies were in the College of Engineering and upon completing this work he received the degree of Bachelor of Agricultural Engineering in the College of Engineering. The curriculum was jointly administered by both colleges. The first person to receive the new five-year degree, Bachelor of Agricultural Engineering, was Paul A. Loiselle in December, 1936.

The changes in course offerings during this span of twenty-one years were minor with the basic courses being the same as those offered in 1922 when the quarter plan was initiated. Dairy Mechanics or Dairy Engineering, introduced in 1920, was not offered from 1924-29; it reappeared however, in the Fall offerings for 1929 and continued to be listed thereafter. Household Mechanics, a course which had brought the ladies to Ives Hall, was dropped from the Agricultural Engineering curriculum in 1929 and thereafter was listed under Home Economics. Three new courses offered in the thirties illustrate new concerns and new concepts for the agricultural engineer: Rural Electrification, Horticultural Practices, and Land Maintenance and Improvement. The courses of instruction for 1939-40, the year of peak enrollment, indicate the developments in the basic courses during these years. There were three "400" courses: Field Machinery, Agricultural Drawing, and Dairy Engineering. The seven "500" courses represent the greatest increase of specialized areas: Farm Buildings, Farm Power, Farm Shop, Special Agricultural Engineering Application in Horticultural Practices, Drainage and Irrigation, Practical Experience in Agricultural Engineering, Farm Electrification. The "600" courses included Advanced Farm Structures, Advanced Farm Power Equipment, Advanced Drainage and Irrigation, and Advanced Field Machinery. Special Problems was listed as a "700" course.

In 1931 the eight-weeks Winter Courses in the College of Agriculture, which had been given since 1907, had so declined in enrollment that it was no longer profitable to continue them. The demand now was for shorter courses on highly specialized subjects, such as a two-week course in Field and Power Machinery. Other short courses included a two day course designed to develop an agricultural background for rural electrification service men and a two-day implement dealers course presenting different phases of farm equipment merchandising.

Ives Hall. In 1925 the Department of Agricultural Engineering moved to Ives Hall, named in honor of the late Frederick W. Ives. On February 3, 1926, during Farmers' Week, the new agricultural engineering building was dedicated. The program was opened by Dean Alfred Vivian of the College of Agriculture who paid tribute to Professor Ives for his accomplishments in establishing agricultural engineering as one of the leading departments in the College of Agriculture. Raymond Olney, Secretary of the American Society of Agricultural Engineers, represented the society and

pointed out that Ives Hall represented the recognition that had been accorded agricultural engineering at The Ohio State University and in the state. Reviewing the growth and development of agricultural engineering at the University was H. C. Ramsower, first Head of the Agricultural Engineering Department. Others at the dedication were Finley P. Mount, President of Advance-Rumely Co., who represented the National Association of Farm Equipment Manufacturers, and E. J. Riggs, an Alumnus and Ohio legislator, who represented Ohio farmers. Ives Hall was formally dedicated by Harry Caton, a Member of the Board of Trustees of the University and Grand Master of the Ohio State Grange. The building was declared to be "one of the largest and best equipped units, housing agricultural engineering exclusively, in the United States."

Student Branch Activities. Ives Hall was the scene of much activity in the years following the dedication. The Ohio Student Branch of the American Society of Agricultural Engineers found it could easily be converted to a lunchroom for Farmers' Week or to a ballroom for the Open House Dance. A very successful money-raising project was the operation of a lunch counter in Ives Hall during Farmers' Week for the convenience of the many visitors to the department. Each year the student members of the society sought to improve their lunch stand by enlarging it and by make it a more efficient operation. In 1928 with six thousand visitors on campus and keen competition between other student organizations and the regular campus cafeteria to serve the guests, the Ohio Student Branch of the Society netted $174.43. In 1938 and 1939 attendance at Farmers' Weeks rose to some eleven thousand and the net profit of the lunch counter rose to $300.00 and $450.00. The money earned paid the costs of field trips and of sending representatives to National ASAE Meetings. These field trips included inspection trips in 1935 to Zanesville, Ohio, to visit the federal soil erosion control experiment farm, and to Akron, Ohio, to visit the Goodyear Factory in operation; in 1938 a visit to the Ford, General Motors, and Cadillac Plants in Detroit, Michigan; and a 1300-mile trip in 1939 to the Tennessee Valley Authority project for twenty-nine students and one faculty advisor travelling with six automobiles and one motor-cycle.

In 1932 the Annual ASAE Meeting was held at the Ohio State University and the Ohio Student Branch utilized the opportunity to operate their quick lunch and soft drink counter. The next year Purdue University was host to the Summer Meeting of the ASAE, and there the organization of agricultural engineering students held its first election of national officers to its National Council of Student Branches. The winners were Henry Collin, Oregon State College, President; Stanley E. Hill, Ohio State University, Vice-President; and Shafer Meeks, Pennsylvania State College, Secretary-Treasurer. Again in 1934 at the Annual Meeting in Detroit, the Ohio Student Branch was honored with the election of Charles Schlotterbeck as Vice-President. Two other students who had earned the privilege of attending the 1934 National Meeting were Merritt Monson and Wayne Shober. Since there were many students eager to attend the Annual Meeting of the Society, selection was done by a point-credit system which rewarded faithful workers.

To be a success, every organization needs faithful workers. The Ohio Branch, with its many hardworking students, won top national honors in 1937 when it received the Farm Equipment Institute Cup at the Annual June Meeting. This award, given to the Student Branch which presented the most outstanding record of activities and achievements for the year, was for 1936-37.

It was President William Gill's delight to present the cup the following November to the Ohio Branch. Two years later, in 1939 at the Annual Meeting, the Ohio Student Branch won third place in the FIEI Award Contest. National honors had come as early as 1926 when Edwin M. Cupp of the Ohio Branch of the ASAE had taken second place in an essay contest conducted by the J. I. Case Threshing Machine Company. With the subject, "The Advantages of Tractor Farming," the contest was open to junior and senior agricultural engineering students in any university in the U. S., or Canada.

To keep graduates who were former members of the Student Branch informed of the campus events, a newsletter was first published in 1936 under the direction of Glenn Foltz, President: Harris Gitlin, Vice-President; and Paul Rofkar, Secretary-Treasurer. Glenn Foltz had come to the presidency with a reputation for engineering practical jokes. During a previous Farmers' Week, the ASAE banquet was held in the west half of Pomerene Hall while the Animal Husbandry group was meeting in the east half. At the head table sat Professor McCuen, Professor Overholt, Professor Reed and other honored guests. In the midst of the meal, with timed precision and by pre-arrangement, Mr. Foltz elbowed a passing waitress, causing her to drop her tray of dishes. Immediately arising to her defense were two of Foltz's friends who challenged him for assaulting a waitress. Off came jackets, up went the shirt sleeves, and then began the blows, until Shorty Cobb, campus cop of that era, broke up the fight and startled to hustle the young gentlemen from the dining room. But he got no farther than an empty chair, reserved for him at one of the tables, where he sat down and began to enjoy the banquet with the engineers. However, Professor McCuen, Head of the Department, was not enjoying his meal; all he could utter while this uproar was taking place was "My God! Oh, My God! what will the Animal Husbandry people think of us!"

In 1940 Professor McCuen and Professor Overholt were rewarded for their patience and endurance. The Ohio Student Branch of the ASAE honored both Professors at the Annual Spring Banquet in recognition of their twenty-five years with the Department. Students in charge of the banquet included Robert Hartsock, President; Harris Gitlin, Vice-President, Edwin Miller, Secretary-Treasurer; and Austin Spetka, Sergeant-at-Arms.

One tradition, other than practical jokes, that has been continued is the student-faculty baseball game at the Spring picnic. One of the first references to this annual display of skill and strength was in 1938 when the Student Branch voted to challenge the faculty to a baseball game at the June picnic. It is not recorded who won.

The Branch won a large gold loving cup for the most original and best presented float in the Engineers' Day Parade held May 13, 1938. As Ralph Patterson, Secretary for the Branch reported:

> "The float for the Department of Agricultural Engineering depicted four ways in which an agricultural engineer can go through college. The first was a freshman with his nose to a revolving grindstone; the second, a sophomore riding a pony; the third, two juniors polishing apples; and last, but not least, was a senior riding a manure spreader." (ASAE Journal, Vol. 19, (1938), p. 288).

The agricultural engineers not only took top honors in their competition with the engineering student groups; they also came out in first place with the agricultural students. The next year (1939) when Gordon Royle was President, the Ohio Student Branch of the ASAE won a plaque for the first prize booth at the All-Ag Jamboree. The theme was that electricity could produce more power at less cost than any man could. The apparatus was a generator operated by pedaling a bicycle. The maximum output among the better pedalers was about 200 watts and they were able to maintain this for only a few seconds. It was demonstrated that an average man would have to pedal 10 hours to produce 5 cents worth of electric power.

The agricultural engineers found electricity to be indispensable, and it appears that their chaperones also considered electrical power to be useful. For a square dance held in Ives Hall in 1941, two machinery laboratories were cleaned and decorated to make room for the square dance orchestra, dancing, card playing, ping pong, dart games, and a Du Pont motion picture on the side. But surely the highlight was the electric fence that kept couples from straying too far!

In the Fall of 1941, the Student Branch of the ASAE was already losing members to the armed services; only twenty-nine old members returned to OSU when classes resumed. From 1943 on, the Student Branch was inactive for the duration of the war.

Extension and Farmers' Weeks. Farmers' Week continued to provide an opportunity for the extension specialists and the research and teaching staff to present the Ohio farmers with the latest developments in the use of machinery and electricity, in the reclamation of valuable farm land, and in the construction of comfortable farm homes and efficient service buildings. Throughout these twenty-one years, the average annual attendance for this special week was over six thousand. In 1940 over thirteen thousand persons were registered for Farmers' Week. The program for this year lists some thirty agricultural engineering topics, with many reflecting the projects developed and explored in Extension for this twenty-one year span.

One demonstration--the Sewing Machine Clinic given by Roderick D. Barden--has a history that begins in 1925 when Professor Barden urged Ohio homemakers to bring discarded and junked sewing machines to meetings held throughout the state. By showing the women how to clean, repair, and adjust their machines, Professor Barden demonstrated in many Ohio communities that the Extension Service did have information to impart that was of value to the farmer and his home. The doubting "Thomasines" who came toting their sewing machines in wheelbarrows and on the running boards of their cars rushed home to show their families that their old sewing machines now sewed better than their new ones. In the first year alone, 99 clinics were held and 1000 machines put in good running order; the next year there were 143 clinics and 1586 revitalized sewing machines, with continuing interest in this subject for the entire period.

Professor Barden also addressed this 1940 group of farmers on the topic "Plow Adjustments and Problems," a subject linked with good plowing, yet the criterion of a good farmer. To create an interest in better plowing, annual plowing matches were held which gave an opportunity

to compare good and poor plowing, to demonstrate effective hitches and proper adjustments for the plow, and to discuss the ways to conserve labor costs. The first plowing match was held in Mercer County in 1928. In some of the matches farmers were able to compare tractor-drawn and horse-drawn plows at work. During the depression, many farmers, finding horse feed to be cheaper than tractor fuel, sought a solution to the problem of using horses with tractor gang plows. To solve this problem, a hitch cart was devised using a Ford Model T front axle.

Professor Barden's third topic, "Power, Labor, and Equipment in Your Farm Program," is linked with Professor McCuen's topic, "Farm Power Marches On." By 1940 farm power was marching on with dealers and manufacturers finding it difficult to supply enough equipment to satisfy the farmer's demands. The estimated number of tractors in Ohio in 1940 was 94,598 with the majority purchased since 1935. To educate the consumer the Extension Service held tractor schools, farm machinery demonstrations, and care-and-repair programs. One successful meeting was the combined power field day where demonstrations were given of how power may be used efficiently both on tractor-drawn and on horse-drawn equipment. Power field days also gave an opportunity for those interested in buying mechanical equipment to see different makes in the same field operating under the same conditions. As many as fifty farm machinery and farm power schools each lasting three weeks, were held each year in the late twenties and late thirties; one goal was to help the farmer lower the cost of production by a more efficient use of farm power and a better understanding of the adjustments on field machinery. Although the emphasis in 1930 and again in 1940 was on purchasing new equipment, the emphasis in the first part of both decades was on repair and maintenance of old equipment; in the depression the farmers had little money to make new purchases and during World War II farm equipment was rationed. Because of the great demand for labor-saving equipment during the war years, plans for homemade equipment were issued. Electric brooders, grain elevators, and buck rakes to handle hay were popular do-it-yourself items. The 13,000 copies of the buck-rake bulletin printed in 1941 were depleted by the end of 1942.

Professor Glen McCuen's other subject during this 1940 Farmers' Week program was "Economics of the Combine Harvester." A related one was Professor Edward Silver's "Efficiency of the Combine Harvester." Since 1925 when soybeans were first harvested with a combine, Professors McCuen, Barden, and Silver had studied combine use in Ohio, and from 1936 on the small combine for grains came into the state in large numbers. The savings of harvesting losses and the great reductions in the labor were selling factors. With the increase in combine usage, special combine schools were held to demonstrate adjustments for best performance.

Professor Silver also discussed "Machinery for Handling Grass Silage" on the 1940 program and George R. Shier discussed "Silo Design for Grass and Corn Silage." With high production quotas in the forties for "Food for Defense," handling and storing large quantities of all feed materials presented problems. Extension specialists devised emergency methods such as silage trenches in the ground and grain bins requiring only a few nails and a minimum amount of lumber--which could be recovered later for other purposes.

Professor G. R. Shier and R. C. Miller were the speakers at the Farm

Who is that handsome man with the ladies? It's R. D. Barden conducting a sewing machine clinic at the Ed Wilson home at Leipsic, Ohio in 1925.

Ohio agricultural engineers have historically been interested in improved harvesting efficiency. Back in 1929, McCuen and co-workers conducted tests on this Avery threshing machine.

Building Clinic for the 1940 Farmers' Week. In separate addresses they covered "Concrete," "Ventilation," "Siding and Roofing" and "Paint." The use of concrete on the farm was a new project in 1926 with demonstrations on the making, placing, and curing of concrete according to the latest methods, but it was still a subject of importance in 1940. Special processing techniques became important as new machinery led to a decreased length of time from the fresh-cut state to the storage of crops. During 1941 a new drying system was installed in the dairy barn on the University farm to study and to demonstrate barn curing of partly dried hay.

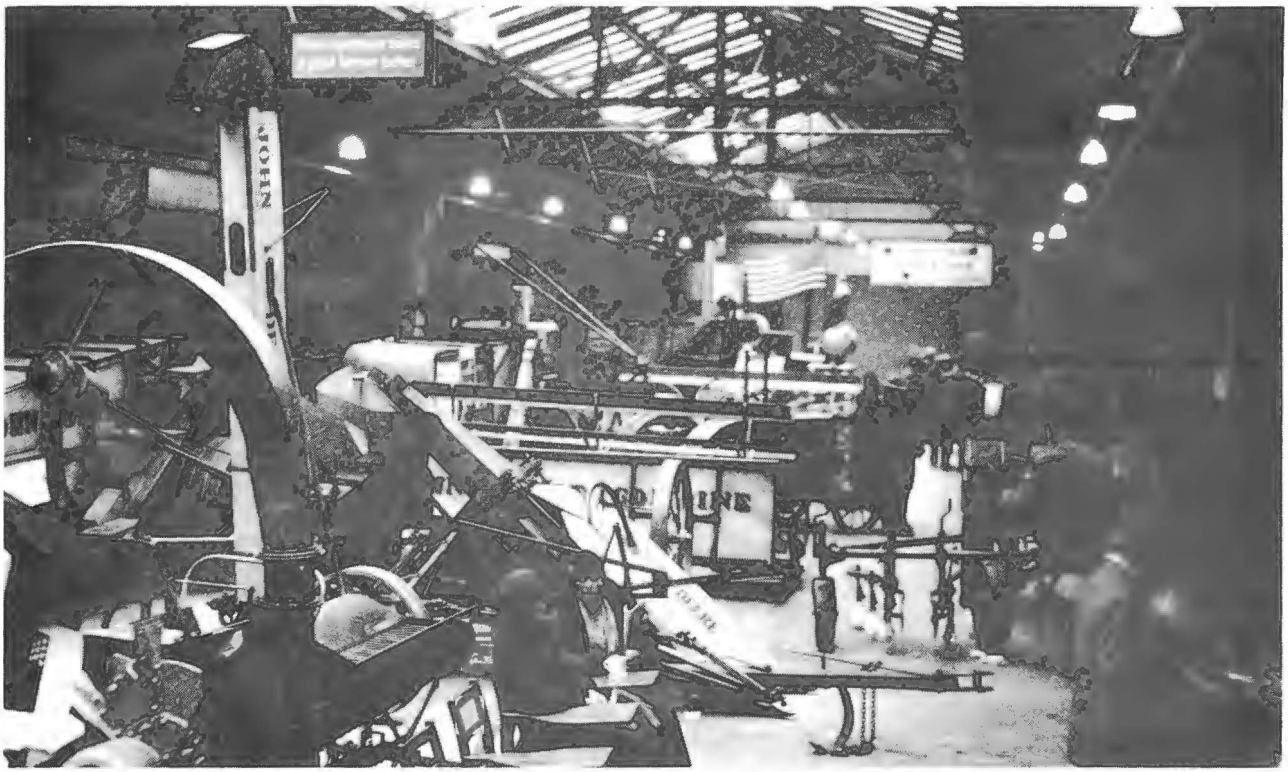
Two other talks which emphasized the building program were "Buildings Fitted to Your Farm Program" by Professor Shier and "Method of Planning a Farm Home" by Professor Miller. To promote home improvements, a Farm Kitchen Improvement Contest was begun as early as 1926 in Huron County. Over sixty farm homes were visited and scored on their conveniences and arrangements; the following year they were visited again and rescored to judge the one most improved. During the depression the Federal Housing Administration supported a rural housing campaign to encourage better farm homes. For all kinds of construction, great emphasis was placed on the principles of building layouts in the late thirties, and then on the need for increased food production in the forties. The capacity of farm buildings was important too because the storage capacity affected the use that could be made of the land, labor, and livestock, and influenced the methods of marketing the crops.

Electrical power was closely linked with the remodeling of farm homes and the adoption of labor-saving equipment on farms. Addresses at the 1940 Farmers' Week given by I. P. Blauser indicate two areas of concern for extension specialists: "Planning for Electric Service" and "Profitable Uses of Electricity." The range of uses for electricity on the farm is illustrated by some of the Extension Bulletins published on this subject--"Electricity in the Farm Laundry," "Electric Ranges," "Artificial Light for Plant Growth," "Electricity on the Dairy Farm" "Electricity in Poultry Production." Indicative of the rapid growth of rural electrification in Ohio, the number of farms in Ohio with high-line electric service increased from 16,000 in January, 1924, to 180,000 in January, 1945. Thus, 77 percent of the farms in Ohio were using electric service at the end of this period.

The two other talks given by Professor Blauser at this 1940 program, "Farm Water System" and "Sewage Disposal Problems," cover areas related to electrical service on the farm. With electricity as a source of power, water under pressure became easily available. The next step was the installation of a bathroom which then presented a sewage disposal problem.

Another related subject was "A Safe Water Supply: Wells and Springs" as discussed by Professor Overholt. A good source of water had always been important (during the depression the emphasis had been on securing a safe water supply through well-improvement, a project which involved little cash outlay and contributed materially to the healthy farm family) but now, with electricity, water was being used in greater quantities in the kitchen, the laundry, the bathroom, the milk house, and the poultry house.

Another of Professor Overholt's topics at this 1940 Farmers' Week was "Irrigation: Estimating Equipment." The large acreage in Ohio of high-acre value crops, such as vegetables, fruits, and hybrid corn, made



The "Farmers Week" machinery display at Ives Hall was always the center of attraction for many farmers and their wives. The year - 1930.

The A.S.A.E. student lunch room gave students the opportunity to practice assembly line food preparation and business management while visitors at "Farmers Week" enjoyed the good food. Can you help identify the energetic workers?

supplemental irrigation an important practice. In the late thirties the development of lightweight pipe with quick couplings provided a practical method of irrigating greater areas. Further, farm ponds were being designed to store water for irrigation, livestock, spraying, and recreational purposes.

A correlary concern for agricultural engineers was drainage. Two other talks by Professor Overholt in 1940 were "Some Problems in Draining Wet Land" and "Open Ditches and Tile Mains." Interest in drainage in Ohio and requests for help in draining fertile land had commanded much of the agricultural engineer's attention in early extension work. In this twenty-one year period, Ohio farmers continued to lay tile drainage; after a particularly wet season in 1929, so many requests for drainage demonstrations were received that a drainage field day was held at the Agricultural Experiment Station. During the depression, emphasis in drainage was placed on improvement of wet spots under cultivation. Then, as the New Deal became effective, drainage and the control of soil erosion became major goals. The Federal Erosion Experiment Station near Zanesville did much to awaken the Ohio farmers to the seriousness of soil erosion. Within a year of its establishment (1932) the erosion specialists showed that 4 to 6 inches of the top soil of this farm had been eroded since the land had been cleared. They further demonstrated that the runoff and consequent soil losses from forest areas was small compared to that from cultivated fields. Throughout the state, CCC camps worked to maintain drainage ditches and to control gulleys and other forms of erosion. WPA projects included the construction of ponds and stream bank control. As extension specialist, Professor Overholt made recommendations and prepared specific plans for much of this work.

With increased production in the early forties, farmers looked for potentially productive land. The Black Swamp of Northwestern Ohio was one major area of concentration for the extension specialist. Another area that required a great deal of attention was Southeastern Ohio which needed drainage of fertile bottom land to permit the retirement from cultivation of eroded hill land.

As Professor Overholt's talk, "Use of Explosives on the Farm," in 1940 indicates, explosives had been used for clearing land and digging ditches since World War I. The emphasis on their uses, however, shifted somewhat during these years; in the twenties land clearing was the object but in the thirties improvement of cleared and cultivated land was principally desired. More than enough land was tillable, but with the introduction of tractors and other machinery, fields needed to be cleared of stumps and boulders which had offered less of a problem with horse-drawn implements.

Although it was easy in 1940 to stress power and machinery, the planners of Farmers' Week realized that the farm shop with its tools was indispensable to keep a farm operating smoothly. Mr. A. C. Kennedy brought this message in his three topics: "Sharpening Edged Tools Used on the Farm", "Sharpening Farm Saws," and "The Farm Shop and Tool Equipment for the Farm."

A few other activities in Extension during these years are seen in some of the State Fair Exhibits, another medium by which the Extension Service reached Ohio farmers. In 1924 one concern was to improve the poultry farmer's income by enabling him to care efficiently for large

flocks; the fair exhibit was a full-sized model of a multiple-unit poultry house with equipment. A frequent event in the 1920's was a poultry house raising supervised by the extension specialist. In 1929 Mr. Twitchell and Mr. Blickle prepared a new poultry house bulletin; in two months more than 11,000 were distributed. The next year a poultry train sponsored by the Poultry Department carried exhibits relating to poultry houses. The extension agricultural engineers prepared, supervised, and lectured upon these exhibits.

With increasing restrictions by city health departments regarding requirements for dairy barns and milk houses, the 1929 State Fair Exhibit explained milk cooling by running water. At one end of a milk house, a concrete cooling tank was constructed. Cold water, supplied by a pump, passed around the cans of milk placed in the cooling tank and then ran through an overflow pipe to a concrete stock tank located in the barnyard. In 1930 and 1931 many calls for aid in remodeling old barns and for new dairy plans resulted in State Fair Exhibits of a model dairy stable and milk house in those years.

By 1928 the corn borer had become established in Ohio. The exhibit that year gave a complete story of the corn borer including its life history, conditions affecting its growth and spread, and its control.

Combating the Corn Borer. The European corn borer invasion of the state in the early twenties threw a tremendous amount of extra work upon the research as well as the extension staff. Professors Glen McCuen, Chester O. Reed, and Edward A. Silver devoted a great deal of their time to corn borer control with machinery. Some of the first machines designed in the department for control of the corn borer were tested in 1925-26. At the 20th annual meeting of the ASAE, held at Lake Tahoe, California, in June, 1926, Professor Reed presented a paper, "Machinery in Corn Borer Control". Since entomologists had found very few borers in the corn plant at or below the ground surface, it appeared that adequate control could be obtained by cutting the stalks within an inch of the ground and destroying them. The development of a low-cutting attachment for corn binders was complicated by problems of soil, stones, and weeds. Two types of low-cutting attachments were ultimately developed to a satisfactory point, one employing a reciprocating knife and the other a disk cutter. An efficient rake to clean up the fields and a properly adjusted plow were also necessary in the control by mechanical means. The Extension Service published the bulletin "Plows and Good Plowing" by Professors Reed and Silver to help spread their findings in corn borer control.

In 1927 the United States Congress passed an act authorizing a ten-million-dollar, corn-borer clean-up campaign with Professor Chester O. Reed in charge of the engineering division of the program. The University granted Professor Reed a leave of absence for the Spring Quarter of that year so that he could take charge at the campaign headquarters in Toledo.

At the fourth annual conference of the International European Corn Borer Organization at Toledo in September, 1928, the agricultural engineers, with Professor Reed as Chairman, demonstrated the control machinery and attachments in the process of development, such as a stubble pulverizer, an ensilage harvester, a field burner, and binders equipped with low-cutting attachments.

Professor Reed's cooperation with the agricultural engineering division of the USDA resulted in USDA Circular #123, "Fighting the Corn Borer with Machinery in the Two Generation Area," by Reed and R. B. Gray, 1930. The battle with the corn borer was not over, but the efforts of the agricultural engineers had slowed its advancement.

Research and Reports. As a power and machinery specialist, Chester O. Reed foresaw new problems to be confronted due to use of modern machinery. At an Institute of Rural Affairs held by the Virginia Polytechnic Institute in 1929, Professor Reed led the engineering section, "The Effect of Farm Power and Machinery on Agriculture," and opened the section with his contribution, "Problems Arising from the Application of Modern Machinery in Farming."

A later article by Professor Reed, "The Machine Designer's Achievements," written for the 25th anniversary of the American Society of Agricultural Engineers, recognized the versatility and adaptability of the implement designer whose "field covers a vast range of design from the intricacies of soil-working surfaces to the efficiency of elements in machines that prepare produce for market." (ASAE Journal, Vol. 12, (June, 1931), p. 208). A respected author, Professor Reed was asked by the Encyclopedia Brittannica to write an article, "Agricultural Machinery and Implements." And one of Reed's bulletins, "Common Binder-Head and Knotter-Head Troubles and Remedies" was translated into several languages and used by some of the large harvester companies.

At the 26th annual ASAE meeting held at Ohio State in June, 1932, Professor Reed presented the paper, "Fertilizer Application for Corn Production," which was later printed in the ASAE Journal for August, 1932, as "The Ohio Fertilizer Placement Tests with Corn Planters." As the originator of the Ohio multiple-plane method for accurate recording of relative placement of seed and fertilizer, Professor Reed had taken a pioneering step in tracing the movement of fertilizer in the soil, studies which then led to a more efficient and safer usage of fertilizer with crops such as corn. Along with this work, Professor Reed served as Chairman of the ASAE Joint Committee on Fertilizer Applicatic

In 1937 the recipient of the Cyrus Hall McCormick Gold Medal, given for "exceptional and meritorious engineering achievement in agriculture," was Chester O. Reed. In his response to that award, Professor Reed looked at the history of agricultural engineering and discussed the role this particular science should play in today's world. The significance of that speech, "Agricultural Engineering and Its Public," has not been lessened by the passing of thirty-three years.

On June 11, 1940, Chester O. Reed died at Columbus, Ohio. That his death was a great loss is indicated by the brief tribute paid to him in the ASAE Journal for July, 1940. (p. 287).

> "As a teacher he rated high with college presidents and other leading educators, and with his students. For two successive years he was voted, by a large majority of representative upperclassmen, the most interesting teacher in the Agricultural College of Ohio State University. He felt and lived up to a sense of responsibility to contribute to the well-rounded development as well as the technical instruction of his students.

A full schedule and large responsibilities never kept him too busy to give time to helping them individually with personal problems. Many of them continued to feel, after graduation, that they were still students of his, and called on him whenever possible to renew the inspiration gained from contact with him.

As an agricultural engineer, his specialty was field machinery, but he kept himself well-informed, maintained a broad and progressive outlook, and proved a competent advisor on all branches of agricultural engineering. His measure as an engineer showed up in his rare combination of ability to be intensely practical in matters of administration, and fundamentally scientific in questions of research."

For the first ten years of the Agricultural Engineering Department, research in the department was conducted solely on a departmental basis. But beginning in 1925, a small amount of research was performed jointly between the College of Agriculture and the Ohio Agricultural Experiment Station at Wooster. Under this arrangement, the Department of Agricultural Engineering was responsible for all research in agricultural engineering in the Experiment Station, with its headquarters at the University rather than at Wooster.

Thus in 1925 Edward A. Silver was appointed the first Research Engineer in Agriculture. His early work was with Professor McCuen on the combine harvester and with Professor Reed on corn borer control. In 1927 he authored with Professor Barden the extension leaflet, "Corn Harvesting Methods for Corn Borer Control." His interest in the combine continued into the thirties when he and McCuen completed a study, "Power Requirements and Efficiency of Grain Threshers" (1934) and then conducted field tests of small combines, giving the results of their findings at Chicago in 1937. In 1942 Silver followed this general study with an analysis of the "Efficiency of Combines at Various Stubble Heights."

Professor Silver began a series of investigations in a comparatively new field in 1928 when he reported a "Study of Power Requirements and Capacities of Large Farm Feed Grinders." Within three years he was serving as Chairman on the ASAE Committee for Feed Mill Rating, and directing an analysis of "The Characteristics of Feed Mill Performance." These studies led to more extensive work in the testing of the fineness of ground feeds and in the effects of the ground feeds in the digestive processes of cattle. At the June ASAE meeting in 1932, held at OSU, Professor Silver presented "Interpretation of the Index System for Testing Fineness of Material" and in 1935 at the University of Georgia he gave the paper, "Digestion Studies of Cattle in Relation to Processing Feedstuffs." A subsequent study in 1938 brought forth a proposal for "Determining the Uniformity of Ground Feeds."

In 1940 Edward A. Silver was elected Vice-President of the American Society of Agricultural Engineers and in the following year served as Chairman of the Committee on Research. His editorial in the January, 1941, ASAE Journal speaks of his own philosophy of engineering "Research Is Reflective Thinking."

Extension Specialists R. D. Barden, H. P. Twitchell, Virgil Overholt,

How many of these "old timers" do you recognize in this 1932 photo of the American Society of Agricultural Engineers at O.S.U. Those we can identify are (left to right): 1st row; Stanley Hill, Lee Celland, Dale Bee, Bernard Glenn, and _____. 2nd row; L. T. Bailey, G. W. McCuen, _____, and _____. 3rd row; Jim Carrell, Virgil Overholt, E. A. Silver, H. P. Twitchell, and R. C. Miller.

C. O. Reed was recognized as an outstanding teacher. The students with him whom we can identify are: 4th from left, Earl Nelson, then Howard Haise and Bob Hartsock. About 1936.

G. R. Shier, and I. P. Blauser were involved in several research activities of the department and were participants in many of the ASAE annual meetings.

In 1932 the Conference of Extension Agricultural Engineers was held in conjunction with the annual ASAE meeting at Ohio State. Professor Barden and Instructor Twitchell participated in the symposiums related to their particular fields, Power and Machinery and Structures. In research Professor Barden concentrated on farm and household conveniences and made a study in 1943 of "Emergency Methods and Equipment to Meet Wartime Needs." Harold P. Twitchell worked in the twenties on hog houses and equipment and on poultry houses; one pertinent study was "The Effect of Heating the Floors of Poultry Houses on Keeping Litter Dry in the Winter and Spring." G. R. Shier who began extension work in Structures in 1936 conducted an interesting study in 1941 on the "Relation of Agronomic and Nutritional Factors to Engineering Problems and Farm Practices in Making Grass Silage."

I. P. Blauser's work began with a study of the use of electricity at the Marysville Experimental Line. Then, through increasing use of electrical energy, problems covering practically every branch of agricultural activity came to his attention and necessitated the broadest contacts. With A. R. Winter, Department of Poultry Husbandry, Blauser wrote "Electric Lights for Supplying Biologically Effective Ultra-Violet Light," a study of how to protect against rickets in chickens. An economic analysis presented at the Chicago ASAE meeting in 1940 by Blauser concerned large and small feed grinding units for dairy farms. In the field of Agronomy, I. P. Blauser took an important step with his studies of "Soil Sterilization by Electricity," a paper first presented at the 29th Annual ASAE Meeting at the University of Georgia in 1935 and later selected to be one of five papers presented by the United States at the second International Congress of Rural Engineering in Madrid, Spain.

Virgil Overholt's work as an Extension Specialist took him into such varied fields as fruit and vegetable storages, stump blasting, sewage disposal, and tractor conversions, but his primary research was in drainage and conservation. In 1928-29 he made an extensive study of the drainage system of the Paulding County Farm, and at the 26th annual ASAE meeting (1932) presented a paper on "Agricultural Drainage in Ohio." Professor Overholt's work with the CCC camps during the depression was reported in a paper given in Detroit in 1934 at the annual ASAE meeting--"The Relation of CCC Erosion Control Work to Agricultural Engineering Extension." In 1937 Professor Overholt gave pioneering emphasis to the protection of stream banks in a paper presented at the June meeting of the ASAE, and in the following year he presented an important study of "State Laws Relating to Drainage Organization." At the Chicago meeting of the ASAE in 1938, Professor Overholt complemented this work in drainage with a study of "Supplementary Irrigation in the Central States."

Throughout these years Virgil Overholt was recognized as a leader in his field, and the many times he served in national chairmanships testify to this fact. At the 25th annual ASAE meeting held at Ames, Iowa, in 1931, Overholt served as Chairman of the Committee on Land Draining. At the 29th annual meeting of the ASAE he presided as Vice-Chairman over the activities of the Land Reclamation Division. It was at that meeting that the division's name was changed to Soil and Water Conservation. Thus in 1936 at Estes Park, Colorado, Professor Overholt served as the Chairman of the Division of Soil and Water Conservation at the 30th annual ASAE meeting.

In 1933, Professor McCuen, with Professor Ralph U. Blasingame of Pennsylvania College and Dr. J. Brownlee Davidson of Iowa State College, traced in detail the development of twenty-five representative farm machines over two decades in "Report of an Inquiry into Changes in Quality Values of Farm Machines Between 1910-1914 and 1932." The examination dealt not only with the whole unit but with the evolutionary changes in every part of the machine. The total number of pieces studied in the twenty-five machines was 13,318.

Benton M. Stahl and R. C. Miller directed their attention in these years to the cost of farm buildings and satisfactory returns on investments in farm structures. R. C. Miller's paper "The Battle for Adequate Farm Buildings," delivered at the Chicago ASAE meeting in 1934, was later used by the Federal Housing Administration in its rural housing campaign. In extension during the depression Professor Miller showed that good farm structures, such as the dwelling and service structures, including fences, are vital to farming whether considered an industry or a mode of life, and in his paper for the 29th annual ASAE meeting at the University of Georgia he spoke for "Farm Fencing as an Investment." In 1939 Professor Miller broached a new subject at the June meeting of the ASAE with his paper, "The Algebraic Concept in Land Valuation."

William A. Junnila, who was appointed Research Engineer in 1940, did early experimental work on dehydration of fruits and vegetables, and C. B. Richey, appointed in 1941, studied trends in hay production and the feasibility of mow curing of hay.

Corn and Grain Mechanization. In the total mechanization of corn production, Professor Glen McCuen was ahead of his time when he commenced his project in 1922. By 1924 even those who were most critical saw that a great amount of work was being accomplished with a small expenditure of human effort. As various operations of corn production became mechanized, Professor McCuen reported the results, such as his paper at the Winter ASAE Meeting in 1926--"Latest Developments in the Motorization of Corn Production." By 1927 Glen McCuen had proven that the time necessary to grow and harvest an acre of corn could be reduced from 26 to 5.77 man-hours. At the June ASAE Meeting at Moline, Illinois, in 1930, a symposium was held on "The All-Purpose Tractor in Corn Production" with five speakers covering different aspects of mechanized corn production:

1. "Handling Large Yields of Corn with Machinery," Ira C. Marshall, Ohio farmer and world's champion corn grower.
2. "Corn Growing--Usual vs. Corn Borer Conditions," R. H. Wileman, Agricultural Engineer, Purdue, University.
3. "Practical Motorization of the Corn Crop," J. Leo Ahart, Agricultural Engineer and Iowa farmer.
4. "Corn Crop Production Costs," R. I. Shawl, Agricultural Engineer, University of Illinois.
5. "Management of a Motorized Corn Farm" E. M. Mervine, Agricultural Engineer, Iowa State College.

Directing the symposium was Professor McCuen; in a summary of this discussion for the readers of the July ASAE Journal for 1930, the unidentified reporter stated that "G. W. McCuen directed his contingent of practical

and scientific tractor corn growers, including Ira C. Marshall, R. H. Wileman, R. I. Shawl and E. M. Mervine, to an oral victory over any "doubting Thomases" who might dare to question the advisability of their methods."

By 1927 the combine had become accepted generally as a practical and highly desirable method of harvesting in almost all regions of the country, and attention was concentrated on improvement and refinement of its operation. At a symposium on "Field Tests of the Combine" at the ASAE meeting in Chicago, 1926, G. W. McCuen, reporting on the activity in Ohio, noted that in 1926 the first combines were used to harvest wheat and oats; soybeans had been harvested with a combine in 1925. The agricultural engineering department had performed tests during these years in cooperation with the farm crops department. Two other speakers at this symposium would be associated with Ohio State in a few years: I. P. Blauser covered "The Combine in Illinois" and R. C. Miller, "The Combine in North Dakota." The popularity of the combine was immediate; the number of combines in a state would quintuple in a year. In 1928, the Nationwide Combine Reports indicated that "the combine is working a revolution in American farming methods unprecedented by any other machine, except possibly the tractor." A greater advance came, however, with the introduction of the small or one-man combine; Professors McCuen and Silver worked together in making field tests of this unit, reporting their findings at the 1937 winter meeting of the ASAE.

Pneumatic Tractor Tires. A major step in agricultural engineering during this period, led by the Ohio State department, was the use of pneumatic rubber tractor tires. Although attempts had been previously made to use rubber tires on tractors, these had been unsuccessful until about 1928. In Florida, operators in the orange groves noted that steel-lugged tractor wheels damaged the roots of their orange trees and installed discarded tire casings to overcome the difficulty. This use of rubber attracted the attention of the rubber tire manufacturers and an adaptation in 1931 was a rubber arch built on a perforated steel base for attachment to standard steel tire drive wheels. In 1932 several companies, including the Firestone Rubber Co., were experimenting with rubber tired tractors and obtaining encouraging results. (R. B. Gray, Development of the Agricultural Tractor in the U.S., USDA, 1954, p. 16).

The first agricultural engineer to test and report on the pneumatic tractor tire was Professor Glen W. McCuen working with Firestone Rubber Co. He reported on the efficiency and versatility of the pneumatic rubber tire at the winter meeting in Chicago in 1932, and was actually booed by the disbelievers in the audience. Opposition to the rubber tire expressed by the advocates of the steel wheel is evident in the many letters printed in the ASAE Journal for 1933 (p. 108), after Professor McCuen's results had been printed in the Journal, "Ohio Tests of Rubber Tractor Tires." (Vol. 14, p. 41). A few excerpts from that paper give us the essential findings of those tests:

> Tests were conducted during the last week of September and the first week of October (1932) on the Ohio State University farm. The soil was typical of Franklin County, having about a half dozen types in the field, ranging from heavy jack wax to brown silt loam. The field was covered

with a heavy growth of timothy and a generous sprinkling of alfalfa plants. The subsoil was extremely dry and the surface wet down about 3 or 4 inches as a result of a two days' drizzly rain on September 26 and 27.

The equipment used for making these tests consisted of an Allis-Chalmers "type U" tractor, the static weight of which, when equipped with rubber tires and wheel weights, was front, 1700 lbs. and rear, 3340 lbs.--total, 5040 lbs.

The following is a brief summary of the results of this one series of tests, to ascertain the relative efficiencies of the same tractor when equipped with regular wheel equipment and low-pressure tire equipment. The steel wheels were the standard 42 by 11 1/8 inch wheels with 6 inch spade lugs on the rear and 28 by 4 plain band type in front. The rubber equipment consisted of Firestone 11.25-14 pneumatic tires on the rear and 6.50-16 on the front. The rear tires were inflated to 12 lbs. and the front tires to 16 lbs. pressure.

1. At normal working loads the rubber tractor tires in 2nd gear required an average of only 91 percent and in 3rd gear only 75.5 percent as much gasoline per drawbar horsepower as the steel wheels in second gear.

2. The greater efficiency of the rubber tires make it practical to do work in 3rd gear which could be done only in 2nd or 1st gear with steel wheel equipment.

3. Under all conditions tested the rubber tractor tires developed a greater effective drawbar pull than the steel wheels with lugs.

4. The low-pressure tractor tires gave a higher average speed than steel wheels. For the same effective drawbar pull the average increase in speed on sod in one series of tests was 36.7 percent and on plowed ground 25.9 percent. This higher speed would, of course, result in a corresponding saving in time.

5. The rolling resistance of the tractor when equipped with low-pressure tractor tires on sod is 31.4 percent and 54.1 percent of that of steel wheels. This low rolling resistance is a large influencing factor in a greater efficiency of the tractor. The power of the engine is not consumed to so large a degree in the propelling of the unit, but is delivered to the drawbar as useful work.

6. A greater efficiency of the tractor was obtained when pneumatic tractor tires were used as wheel equipment for plowing. This increased efficiency was a result of lowering the fuel consumed per acre plowed 23.83 percent and increasing the area plowed by 27.2 percent in the same unit of time.

7. While not measured in these tests, it was obvious that the

tractor, when equipped with pneumatic tires, was a more comfortable machine for the tractor operator to ride. The elimination of severe shocks and impacts should give the tractor a much longer life.

8. The equipping of the tractor with low-pressure tractor tires makes it possible to use the tractor for a greater variety of work without making any changes in wheel equipment.

This was the first report on the pneumatic rubber tractor tire; by the following year everyone was "in the act" with studies of tractor tires being conducted at Kansas, California, Illinois, Nebraska, Wisconsin, Idaho, Louisiana, Pennsylvania, Texas, Saskatchewan. But the real evidence of the success of the rubber tire is seen in these figures: in 1935, fourteen percent of the wheel-type tractors were mounted on rubber; in 1940, ninety percent had rubber tires.

At the 28th annual meeting of the ASAE in Detroit, in 1934, Glen W. McCuen was elected President of the Society for 1934-1935. The following year, the American Society of Agricultural Engineers selected Professor McCuen and Dr. J. B. Davidson (first president of the Society and head of the Agricultural Engineering Department at Iowa State College) to represent the Society at the second International Congress of Rural Engineering, at Madrid, Spain. Five papers were registered by the Society for presentation at the Congress by McCuen and Davidson; two of the five were studies performed at Ohio State:

1. "A Resume of the Uses of Rubber Tires on Farm Implements," by Professor G. W. McCuen.
2. "Improvement of Farm Machines," by Dr. J. B. Davidson.
3. "Sterilization of the Soil by Electricity," by I. P. Blauser, secretary and field engineer, Ohio Committee on the Relation of Electricity to Agriculture.
4. "Development of the General-Purpose Type Tractor and its Adaptation to Agriculture," by Arnold P. Yerkes, International Harvester Co.
5. "Diesel Tractor Development in the United States," by Leonard J. Fletcher, agricultural engineer, Caterpillar Tractor Co.

In 1933 the Ohio Implement Dealers' Association presented a bronze plaque to the Department of Agricultural Engineering at the Ohio State University in recognition of the work which the department had done for agriculture and for the agricultural machinery industry. This plaque in Ives Hall serves as a reminder of this highly productive era of agricultural engineering activities at the University.

Chapter 4

AGRICULTURAL ENGINEERING EXPANDS 1945-1960

With the Allied victory in 1945, the wartime activities of the nation terminated; the farm equipment manufacturers now assembled tractors instead of tanks, the farmer now raised food for peace instead of "Food for Victory," and the young man graduating from high school had the opportunity of becoming a scholar instead of a soldier. Peace-time expansions were many and immediate. Farm operators were anxious to do more than wishful thinking about machinery replacements and long deferred family housing, livestock and storage facilities, and neglected land and water management. Returning veterans filled college classrooms to acquire the knowledge needed for a technological society. And universities, striving to meet these needs, swung into accelerated programs. The Department of Agricultural Engineering at the Ohio State University fulfilled its peace-time role by accepting a heavy teaching load and by providing the information needed by farm producers, industry, and others allied with agriculture. Because of these demands, most of the department's efforts in the 1940's were spent in resident teaching and extension work. But the period from 1945-1960 was one of transition and expansion for the department, and this emphasis on teaching and extension was followed by renewed concentration in research with the establishment of a full-time research staff.

Faculty Changes and Assignments. The agricultural explosion ignited by the ending of the war was expected. For the first time since the depression of the 1930's, the agricultural engineering staff included key personnel in each of its five basic areas of operation: power and machinery, soil and water management, farm structures, rural electrification, and farm and home safety. Staff members were assigned to areas commensurate with their training and interest, and were responsible for one or more of the activities common to each area--teaching, research, and extension.

Professor Glen W. McCuen, Chairman of the Department of Agricultural Engineering, was coordinator of all areas until 1955 when Professor Roderick Barden became chairman of the Department and assumed these duties. Professor McCuen, who retired in 1956, and Professor Barden, who retired in 1960, had distinguished careers in the field of power and machinery. It was during this period that the concept of an Associate Chairman developed to help integrate research efforts into the total departmental program; the Associate Chairman would be largely responsible for the development of and execution of the research program. William H. Johnson was appointed Associate Chairman in 1953.

Other members of the agricultural engineering staff during these fifteen years in the power and machinery field were Arthur C. Kennedy in teaching, who retired in 1954; Carlton E. Johnson, who came to the department in 1955 to teach the courses in Vocational Agriculture formerly covered by Professor Kennedy; Samuel G. Huber, who began in extension work in 1946 and then in 1954 began to devote three-fourths time to teaching; William Gill who started extension work in power and machinery in 1954; C. Edwin Smith, who handled research and teaching from 1946 to 1949; Delbert Byg who taught from 1947 to 1955 when he transferred to extension work in rural electrification; Dwight Warner, who taught from 1946 until his resignation

in 1959; Benson J. Lamp, Jr., who was appointed in 1949 and continued in resident teaching until 1960; George S. Sanders, who conducted research in 1951-1952; John D. Hummell, who did research at the OAES from 1950-1953; William H. Johnson, whose first appointment came in 1948, and James E. Henry, beginning in 1952, continued at the OAES through the end of this period.

In the field of Farm Structures, R. C. Miller continued to play the dominant role in teaching. J. D. Blickle was the lone extension engineer in 1945, but in 1946, Kenneth Battles was added to the extension staff, and in 1956, Roger A. Miller joined Blickle and Battles; all three extension engineers continued in their appointed positions throughout this period. In the early fifties, with a renewed emphasis on research, Homer T. Hurst was appointed to the Ohio Agricultural Experiment Station and served in this capacity from 1951-1955; Warren L. Roller came to the Experiment Station in 1955.

In the field of Soil and Water, Virgil Overholt carried the teaching and extension duties until his retirement in 1956; the extension duties were then assumed by Melville L. Palmer who had been appointed to the staff in 1955, and S. G. Huber devoted part of his extension time to this field in addition to his work in power and machinery. Glenn O. Schwab, appointed in 1956, took over the teaching duties and gave a renewed thrust to the research activities in this field. Two other engineers appointed to research positions included Harris M. Gitlin, 1946-1949, and Truman Goins, 1950-1960.

In Rural Electrification, I. P. Blauser held the front in extension and research for this period; William Junnila concentrated on research from 1945-1947 and Robert Irwin worked in research from 1946-1948. In the fifties, C. K. Kline was on the extension staff from 1951-1954; then Delbert Byg picked up the extension work in 1955 and continued until 1958 when he was on leave for a six-year appointment in India; and finally William R. Schnug was appointed in 1958 to fulfill the extension work in rural electrification. Kenneth A. Harkness, appointed in 1955, took over the teaching duties in this field.

A division of Rural Electrification was Rural Electrification Safety or Electrification Training. Chester High, who had been appointed in 1944 to this field, continued in this post throughout the period. He was assisted by C. W. Hill from 1947-1949 and then by Wayland Hamilton who came into the department in 1955. In cooperation with the Trades and Industries Division, Owen Manning came as an addition to the staff in electrification safety in 1951 and worked until 1955 with the other staff members in instructing electrical service men in the latest development and techniques in installing new equipment.

The field of Farm and Home Safety was established in 1944 with the appointment of W. E. Stuckey to a position of teaching and research. W. E. Stuckey remained on the staff until 1952 when he became manager of the Ohio Electric Cooperatives Association. For three years the position was vacant, but then in 1955 Professor Stuckey returned to resume his work in farm and home safety.

Some of the student assistants in the department from 1945-1960 included M. L. Palmer, Robert Lichti, Thomas B. Jones, Robert E. Teale,

I. P. (Pop) Blauser gave assistance to County Home Demonstration Agents by checking and adjusting pressure cooker gauges. "Pop" was also regarded as "Mr. Farm Electrification" in Ohio. About 1940.

Ken Battles, Extension Engineer, Farm Structures, discusses building improvements at Wyandot County Livestock Day, 1956.

R. W. Asmus, James D. Amerine, Russell H. Hahn, Ronald D. Hill, Wilbur W. Schott and John T. Mercer.

Bulging Classrooms. In this fifteen year period in the Agricultural Engineering Department, the instruction of students took precedence over other duties. The university concentrated its resources and facilities into meeting the needs of Ohio veterans, who, back from military service, sought to start or to renew their college educations. During the first five years, the class enrollments in the department went from a low of 239 students to a high of 1277 students, and then in the 1950's the average class enrollment per year was 700. The high enrollments meant full teaching loads for every staff member. And it was the quality of the instruction and the caliber of the students, rather than the numbers, that gave a true indication of the great achievements of the department during this period. The students who graduated in 1948, 1949, 1950, and 1951 contributed to the largest enrollments in the history of the department with 1167 students enrolled in Agricultural Engineering classes in 1948, 1277 students in 1949, 1242 students in 1950 and 1043 students in 1951. But more significantly, these students some twenty years later are making valuable contributions to the field of agricultural engineering through the challenging positions they now hold. A random sampling of the students from these four years demonstrates the success story of the Agricultural Engineering Department during this period:

Byron L. Bondurant--formerly head of the Agricultural Engineering Department at the University of Maine, now Professor of Agricultural Engineering at The Ohio State University.

Robert C. Evans--Manager of Ventilation Division of Chore-Time, Inc., Milford, Indiana.

M. Lynne Geiger--Product Development Engineer, Ford Tractor and Implement Operations, Troy, Michigan.

Charles L. Hahn--Hydraulic Engineer, Ohio Department of Natural Resources, Columbus, Ohio.

Carl W. Hall--Dean of Engineering, Washington State University, Pullman, Washington.

Robert P. Harbage--Director of Engineering, New Idea Division--Avco Corp., Coldwater, Ohio.

James G. Hartsock--Agricultural Engineering Research Division, ARS-USDA, Beltsville, Maryland.

Robert E. Hellwig--Agricultural Engineering Research Division, ARS-USDA, Tifton, Georgia.

Homer T. Hurst--Professor of Agricultural Engineering, Virginia Polytechnic Institute, Blacksburg, Virginia.

William H. Johnson--Professor and Associate Chairman, Ohio Agricultural Research and Development Center, Wooster, Ohio.

Benson Lamp--Equipment Production Planning Manager, Ford Tractor Opera-

tions, Bloomfield Hills, Michigan.

Wendell R. Milburn--Service Manager, Oliver Corp., South Bend, Ind.

Calvin K. Mutchler--Agricultural Engineer, Soil and Water Conservation Research Division, ARS-USDA, Morris, Minnesota.

John S. Perry--Associate Professor, Agricultural Engineering Department, University of Georgia, Athens, Georgia.

Robert N. Robinson--Senior Development Engineer, Tectrol Division of the Whirlpool Corp., Stevensville, Michigan.

Robert C. Robison--State Conservation Engineer, SCS-USDA, Athens, Georgia.

William R. Schnug--Extension Agricultural Engineer, OSU, Columbus, Ohio.

Gene E. Schram--Farm Power Engineer, Toledo Edison Company, Toledo, Ohio.

Paul W. Stoneburner--Manager of the Stoneburner Construction and Engineering Company, Harrisonburg, Virginia.

Leslie H. Williamson--Agricultural Engineer, SCS-USDA, Indio, Calif.

Clyde L. Wilson--Research Specialist, Monsanto Chemical Company, St. Louis, Missouri.

Raymond W. Wilson--Executive Engineer, Tractor Design, Ford Tractor and Implement Operations, Washington, Michigan.

Programs of Study. Two programs of study were offered by the Agricultural Engineering Department during this period: a five-year agricultural engineering curriculum leading to the degree Bachelor of Agricultural Engineering, which had been initiated in 1935, and a four-year curriculum leading to the degree Bachelor of Science in Agriculture, which had been in existence since the early 1920's. In 1954, the four-year curriculum was named the Agricultural Equipment Science Program to distinguish the four-year from the five-year graduates. Accreditation of the department's program by the Engineering Committee for Professional Development was a highly significant milestone achieved during these years. Following the official inspection in the Spring of 1954, the department became the 23rd accredited department of a total of forty-six departments in the nation. In 1959 the curriculum was fully accredited for an additional five years.

Student Branch Reactivated. With the reactivation of the ASAE Student Branch in 1946, the normal college activities of softball games, field trips, and square dances were resumed. One of the few recorded victories came when the student softball team whipped the faculty team in their annual contest of 1946. In the 1950's the student-faculty bowling match was a high point of each year with the faculty usually subduing the students with the aid of such "pros" as Overholt and Blickle and such regulars as Huber, Warner, Byg, Barden and Stuckey.

Various inspection trips took the students to the John Deere, Minneapolis Moline, and International Harvester plants in Moline, Illinois; to Malabar Farm for a personal tour with Louis Bromfield, who discussed his farm practices; to Fate-Root-Heath, manufacturer of Silver King Tractors in Plymouth, Ohio; to Detroit to tour the assembly plants of Harry Ferguson, Inc., and Dearborn Motors, Inc.; to Newark, Ohio, to visit the Owens-Corning Fiberglass Corporation; to the Firestone Rubber Plant near Akron, and then to the birthplace of Harvey S. Firestone, a large farm at Columbiana.

Originality in parade floats frequently brought honors to the ASAE Student Branch. In 1953 during Engineer's Day, the Branch won the second place trophy with a large mechanical cow named "Atomic Bess," which was pulled by a large weird bug and followed, appropriately enough, by a manure spreader. This fixation with manure spreaders even led to naming an Ives Hall newsletter, that began disseminating news and notices in 1953, The Spreader.

The Farmers' Week lunch stand that had been started in 1919 in the sawtooth building continued in these years to be a money-making project with gross income averaging $3000. and the net income being approximately $1000. The lunch stand was improved and enlarged with major acquisitions each year, including a dishwasher in 1954. Another income project started in 1953 was the Ohio Mechanical Cornpicking Contest sponsored by WRFD at Worthington. In the first contest held, the ASAE student members took charge of the contest proceedings and earned $300.

National recognition came to the Ohio Student Branch of the ASAE when Robert Evans was elected 2nd Vice-President of the National Council at the annual ASAE Meeting in Portland, Oregon, 1948. The following year, Bob, who was president of the Ohio Branch, was elected president of the National Council of ASAE Student Branches at the June meeting in Washington, D. C. On the West Coast in 1958, the National Council of the student branches elected Richard Holdren of Ohio State, 1st vice-president. For the Ohio students in those years, the yearly trip to the national convention took on a special significance. In 1954 at the 47th annual meeting, E. E. Nelson of Ohio State won top honors in the Student Paper Awards, for his paper, "Soybean Losses at the Cutting Bar of the Combine." In the following year, Virgil H. Lucke was the third place winner in the Student Paper Awards for his paper "Corn Husking Investigations." At the June, 1956 meeting, two Ohio State students, John L. Clingerman and John Cryder, were among the students honored for outstanding scholarship and participation in student activities, and in 1957 the Ohio State Branch received honorable mention in the contest for the Farm Equipment Institute Awards.

Extension Activities and Recognitions. The Ohio Student Branch was not the only group that received national recognition in this period. Extension Engineers Kline and Blauser received a blue ribbon at the 1953 ASAE Meeting in Pittsburgh for their slide series, "Infrared Lamps for Brooding and Other Uses." Then at 1956 and 1957 ASAE Meetings, D. M. Byg received three blue ribbon awards for a program activity, "Training 4-H Electric Project Leaders"; a slide series, "Diagnosing Your Electrical Ills"; and a new 4-H publication, "Live and Play The Electric Way". In 1958, William Gill and W. E. Stuckey received a blue ribbon for their movie, "Tractor Tragedy". Then, at an honor awards ceremony in Washington, D. C., in 1956, Extension Engineer Virgil Overholt was honored with a "Superior Service Award" presented by

the Secretary of Agriculture, Ezra Taft Benson.

The extension program in the farm structures area was set up to aid the farm producers in obtaining buildings and equipment that would save time and labor and provide more pleasant working conditions. Facilities that would encourage the use of the best available farming technology were advocated. The program in farm housing was oriented to help the farm family attain a place to live that reflected the personality of the whole family, a home that would fit the family's needs, activities, and interests.

The structures area also maintained an up-to-date plan service for production buildings, equipment, and farm houses. The service made available to farmers not only plans developed by the Ohio agricultural engineers but those developed in cooperation with the North Central Regional Plan Service (Midwest) and the USDA.

In power and machinery, the extension program emphasized careful evaluation before purchasing equipment so that farmers could determine whether a proposed purchase would be an asset or a detriment in the total farm operation. Furthermore the program supplied farmers with suggestions and guidelines in building, maintaining, and repairing their machines and equipment. Safety was a part of all meetings on farm adjustment of equipment, especially if it affected the efficient operation of the equipment as well. County meetings were held on corn planters, grain drills, combines, corn pickers, and plows. At the winter meetings equipment was on hand and used in demonstrating proper adjustment especially calibration of corn planters and grain drills.

In rural electrification, great strides were made in the late 1930's and early 1940's in bringing electricity to Ohio farms. Then in December, 1950, the efforts of Extension Engineer I. P. Blauser proved to be very fruitful in that the "Ohio Farm Electrification Council" was formed. This council was organized with nine members; three from the Utility Companies, three from the REA Cooperatives and three from the Department of Agricultural Engineering. The council had a budget of over $18,000 per year which resulted from an assessment of 10 cents per farm meter from the member electric suppliers. This budget provided for an additional Extension Engineer in Farm Electrification, namely, the Secretary of the Ohio Farm Electrification Council, and for expanded statewide programs in electrification.

Those engineers serving as Secretary of the Ohio Farm Electrification Council during this period were: C. K. Kline, 1950-1954; D. M. Byg, 1955-1958, and W. R. Schnug, 1958 on.

Farm electrification programs during this period emphasized more efficient and safe use of electric power. State-wide programs on "Improving Farm and Home Wiring" were initiated. An extension leaflet "Diagnosing Your Electrical Ills" and a set of slides on the same subject were helpful in explaining the symptoms of overloaded electric wiring. "Running Water" was another state-wide program emphasizing the merits of plenty of running water under pressure. This program was also supported with an Extension leaflet, "Running Water Facts". Other programs included crop drying, materials handling, ventilation, heating and electric brooding.

Leadership training was also given added attention in the farm electrification program. Special "Electrification Conferences" at Nela Park, Cleveland, were held in 1954 for all County Extension Agents; in 1955 for all Vocational Agriculture Teachers; in 1956 for all County Home Economics Agents and in 1957 for all Vocational Home Economics Teachers. In working with youth, the new 4-H electric project literature, "Live and Play the Electric Way" prompted enrollment in this project to reach 3500 in 1959 as compared to 890 in 1950.

In rural electrification safety, a school of instruction was held each year in cooperation with the manufacturers of line equipment and the Electrical Engineering Department. Instruction given to the service men helped to reduce the number of accidents in the field, especially in the work of handling hot circuits on high lines. The latest developments and techniques in installing new equipment on primary and secondary lines were explored at these safety schools.

The most outstanding program in the division of Farm and Home Safety was the tractor tipping demonstration that in two years, 1957 and 1958, reached 110,370 people in eighty-three counties. Concerned by the increasing number of tractor accidents and fatalities, the Ohio Farm and Home Safety Committee, the Agricultural Extension Service, the Standard Oil Company of Ohio, and the Ohio Farm Equipment Association cooperated in the planning, development, execution, and financing of the demonstration. By overturning a tractor, the safety specialist could effectively show both the causes of tractor accidents and the ways of preventing them. In 1959, a survey conducted in cooperation with the Ohio Farm Bureau and Nationwide Insurance Companies showed that tractor fatalities in Ohio were reduced approximately 40 percent from 1956-1959. The Ohio farm safety program achieved national recognition through the efforts of W. E. Stuckey, with Ohio being recognized as the leading state in farm safety.

Extension activities in the soil and water area were varied, assisting in the application of research results. One problem frequently encountered by farmers attempting to drain their land was poor quality concrete tile. To inform people how to select good tile, the Extension engineers published a bulletin in 1957 on the selection of good drain tile. And to encourage better quality in the manufacturing of tiles, they cooperated with the Portland Cement Association, the SCS, and the concrete tile manufacturers in organizing an association of concrete tile manufacturers.

Research Growth. Historically, the department has been known for its research work in harvesting. Professors McCuen and Silver contributed much in the late 30's and early 40's. W. H. Johnson reactivated the work in the early 50's with the following emphases: (1) Characterizing the harvestibility of wheat varieties, (2) Plant factors contributing to high quality corn picking, (3) High moisture harvest and drying of wheat. Professors I. P. Blauser, B. J. Lamp, K. A. Harkness, and H. T. Hurst assisted in conducting certain portions of the work. At the annual ASAE Meeting held in 1954 at the University of Minnesota, W. H. Johnson reported on some of these results of the engineering study of wheat harvesting and storage in Ohio. And in 1957 at the Winter Meeting of the ASAE, Professor Johnson presented the paper, "Machine and Method Efficiency in Combining Wheat."

In the late 1950's, Professor Benson J. Lamp studied in detail the harvesting of soybeans. The objective of the study was to identify the sources of losses from the combine and devise means or equipment to minimize them. Professor W. H. Johnson and K. A. Harkness assisted in this study.

Some of the research work in tillage during this period developed from an experiment that was initiated in 1938 to study the principles of preparing land for corn. This early work, cooperative with the Department of Agronomy, developed results now regarded as classic. The initial project ran for fourteen years with the following agricultural engineers contributing: C. O. Reed, E. A. Silver, C. B. Richey, G. W. McCuen, R. L. Erwin, and W. H. Johnson. Out of this work grew the concept of "minimum tillage" for corn so commonly used today.

In 1952, the tillage project was revived with the work being done at the Northwestern Substation of the Ohio Agricultural Experiment Station at Hoytville. This project too had the emphasis of studying principles of preparing land for corn and it was continued through 1959.

Early in the 1950's considerable interest developed in the aerial application of certain agricultural chemicals and seeds. Professor Barden directed the early work which resulted in recognition for him as well as the department. Later G. S. Sanders and J. E. Henry continued the work. In 1954 at the Winter ASAE meeting, James E. Henry in a paper summarizing the wind tunnel studies of distributors for agricultural aircraft, indicated some of the means being tried to improve the uniformity of distribution of dusts, fertilizers, and seeds from airplanes, and some of the techniques used to determine the distribution. Further work included the modification of an airplane so that it would be more suitable for aerial applications, the development of ways to measure deposits, and the development of equipment for distribution. The project was terminated in 1963. The early work was sponsored by the Ohio Division of Aviation and cooperative with personnel from the Don Scott Airfield.

Another field of investigation was the practicality and economy of an automatic system for alcohol-water injection in farm tractor engines under field operating conditions. J. D. Hummell was active in demonstrating the effect of the alcohol-water injection in increasing the octane rating of regular gasoline. In tests that were conducted, fifty farmer-owned and operated tractors were equipped with injectors that boosted fuel quality as needed by the operating load. The project was sponsored by the USDA, Northern Regional Research Laboratory. Also assisting in this work was J. E. Henry of the Ohio Experiment Station.

In the field of structures, important research was carried out during this period on the storage of crops. R. C. Miller did extensive work on the drying of baled hay by means of forced-air ventilation. Although such drying did require a large volume of air, Professor Miller showed that the hay dried at a rate rapid enough to prevent mold. And farmers found that they could sell this dried hay for $60 a ton as compared to $45 a ton for field-cured hay. One paper on the subject, published in the ASAE Journal for May, 1946, was "Air Flow in Drying Baled Hay with Forced Ventilation" by Professor Miller. The next crop to receive consideration was corn; at a conference on Conditioning the 1947 Corn Crop, R. C. Miller discussed

Research work on metering and distribution devices for airplane application of chemicals and seeds was conducted in 1953. Above, Bill Johnson and O.S.U. photographers are taking high speed movies of grain going through an aircraft spreader model in Jim Henry's wind tunnel.

Jim Henry in the "Ohio Project Plane" as modified by Barden and others. The plane's spray equipment was designed by Jim Henry.

the use of hay-drying equipment for conditioning corn. His paper on this subject was widely distributed throughout Ohio. In the 1950's a good deal of work was done at the Ohio Agricultural Experiment Station on drying and storage of combine-harvested wheat, and in 1954 at the Winter ASAE Meeting in Chicago, Homer T. Hurst reported on these studies.

A project initiated by W. L. Roller was the study of the heat pump for cooling broiler houses. The major problem of dust-fouling of the heating and cooling coils could be alleviated either by the use of dry paper filters or by a porous floor and litter system that would act as a natural filter for recirculated air.

Professor Overholt was instrumental in developing improved farm drainage practices in Ohio from 1915 on, and in the 1950's he worked to safeguard the drainage rights of the farmers in northwestern Ohio who were affected by the construction of the Ohio Turnpike. These efforts were reinforced by the State Soil Conservation Service which established criteria for the protection of drainage interrupted by new highway locations, pipe lines, and coaxial cables. In one of Virgil Overholt's ASAE papers, which he delivered as Professor Emeritus at the 1957 annual meeting, Overholt spoke of "Some Drainage Progress Through the Years." But as Professor Emeritus, Virgil Overholt continued to look ahead, and in 1959 at the 52nd annual meeting held at Cornell, his paper was "Fiber Glass Filters for Tile Drains."

In other work in soil and water, H. M. Gitlin in 1948 developed a facility for "tracing the raindrop" on the Sinclair Farm in North Columbus. The facility was developed to obtain design information on the depth and spacing of tile as needed for drainage systems. This work was sponsored by the Sinclair Oil Company.

A new and more extensive facility for studying the influence of tile depth and spacing on soil drainage characteristics was developed on the Tiffin State Farm. Mr. Truman Goins was responsible for conducting this work for some time cooperatively with Agronomy. At the 1955 ASAE annual meeting, Goins presented a paper on the effects of tile depth and spacing and crops and crop rotations on tile flow characteristics. Later Dr. Glenn Schwab, about 1958, accepted responsibility for the work and continued to serve until the project was discontinued in the 1960's. But a new project in the evaluation of surface, subsurface and combination drainage systems was initiated by Dr. Schwab with the completion of a $40,000 installation at the North Central Substation at Castalia in 1958.

At the 1955 ASAE Winter Meeting, Melville Palmer reported on "Soil Moisture and Soil Temperature in Relation to Tile Drainage," Work associated with soil drainage has continued to be an important function of the department.

New Building at the OAES. During this period, 1945-1960, the research nucleus of the Department of Agricultural Engineering was located in Ives Hall, although plans for facilities at the Ohio Agricultural Experiment Station were under way by 1952. In 1959, an important step was achieved with the establishment of special facilities at the Ohio Agricultural Experiment Station in Wooster for research in agricultural engineering. The advantages were many. Location of the engineers next to Williams Hall, the agronomy and forestry building, permitted closer working of engineering researchers

Research studies on improved harvesting of corn and soybeans were major projects for Lamp, Johnson, and Harkness during the period 1956-1960.

Research facilities were greatly enhanced with the completion of this new building at Wooster in 1959.

with field crops men. And the building itself was versatile enough to permit a wide range of research to proceed at the same time; a crop processing laboratory, an environmental chamber, a small equipment and components laboratory, an electrical control and instrument shop, a soils and water laboratory, and a chemical laboratory were a part of the research facilities.

This new Agricultural Engineering Building at Wooster brought together the research staff of the OSU Agricultural Engineering Department and the USDA personnel of the ARS formerly located at Toledo. Thus the OSU research staff in 1959 included W. H. Johnson, Associate Chairman, Warren L. Roller, J. E. Henry, Glenn Schwab, Kenneth Harkness, B. J. Lamp, and Ronald Hill. The USDA staff included Frank Irons, Orve Hedden, and Ross Brazee.

International Involvement. The department became involved in international programs in 1957. The College of Agriculture in 1955 signed an agreement with the United States International Cooperation Administration to provide educational assistance to the two states in India, Punjab and Rajasthan. In November, 1957, Dean T. S. Sutton visited a departmental faculty meeting and told of the need for an agricultural engineer to undertake a 2-year assignment as a member of the Ohio State University Agricultural Education and Research Mission to India. Delbert Byg and his family, the first selected for the assignment, traveled to Udaipur, Rajasthan, India, where Byg served as Agricultural Engineering Advisor from 1958 to the mid-1960's.

Chapter 5

AGRICULTURAL ENGINEERING AND SCIENCE 1960-1970

The Department of Agricultural Engineering at the Ohio State University responded during the sixties to the science orientation of the space age. Biological engineering, analog computers, laser beams, infrared photography, pollution, and waste control are terms which became part of the agricultural engineer's vocabulary, and of his activities during the decade. To meet these new challenges more faculty, with diverse skills, were acquired to pursue the rapidly-changing goals of the department in teaching, research and extension.

Faculty Changes. Professor R. D. Barden retired in 1960 as Chairman of the Department, and S. G. Huber served as Acting Head until the appointment of Dr. Robert E. Stewart in 1961. Dr. Stewart was chairman until 1968, when he accepted a distinguished professorship at Texas A & M University. From 1968-1969, Professor W. H. Johnson was Acting Chairman in addition to his duties as Associate Chairman; in 1969 Dr. Gordon Nelson, Professor of Agricultural Engineering at Oklahoma State University for the past seventeen years, became Chairman of the Department.

Other changes in the staff during this period included the appointments of G. E. Hall and R. Bruce Curry to the OAES in 1960. In teaching, Benson J. Lamp resigned in 1960 and H. E. McLeod joined the staff in 1962 to fill this position in power and machinery for two years. Professor I. P. Blauser retired in 1962 from his position in rural electrification. With the retirement of Professor R. C. Miller in 1962, the teaching area in structures was vacant to be filled by H. J. Barre in 1963. Two other additions in 1963 were J. C. Notestine, who resigned in 1964, and D. L. Pfost, who left in 1968, both in rural electrification.

Professor Emeritus Virgil Overholt was awarded the John Deere Medal by the ASAE. in 1961.

During the academic year 1964-65, the number of staff increased appreciably. D. M. Byg returned from seven years in India to rejoin the extension group, working in power and machinery. Byron Bondurant, who for a number of years was head of the Department of Agricultural Engineering at the University of Maine, joined the faculty and left for India early in 1965 as a long-term consultant with the Punjab Agricultural University in Ludhiana. Floyd Herum joined the staff and left late in 1964 to become the first agricultural engineer in the new AID program with the College of Agriculture at the University of São Paulo in Brazil. With a joint appointment between this department and the Department of Dairy Technology, J. L. Blaisdell came from a food engineering position at Michigan State University. Larry Segerlind began in structures extension, staying one year.

Early in 1965, E. Paul Taiganides joined the staff to initiate studies in agricultural pollution, coming from Iowa State University. Another addition was R. R. Raney, who left the farm machinery industry to teach part-time in farm machine design and to pursue a graduate program. M. Y. Hamdy came late in 1965 to develop research and courses using the newly-acquired

EAI TR-48 analog computer obtained with the assistance of the National Science Foundation.

Visiting faculty during the period included Dean A. H. Willis, University of South Wales in Australia, who served as Distinguished Mershon Visiting Professor the first half of 1965, Z. Strach, Alex Misiewicz, and Zbigniew Stolarezyk as visiting engineers from Poland, and B. F. DeRoock from The Netherlands.

New Program of Study. The departmental undergraduate curricula were revised substantially twice during the decade. In 1963 the 5-year Bachelor of Agricultural Engineering (BAE) program was modified to reflect new concepts of engineering biological systems for production.

At the same time the 4-year degree program, Bachelor of Science in Agriculture, referred to as Agricultural Equipment Science, was discontinued effective immediately excepting those who preferred to complete the program rather than change.

The service courses were reoriented effective the academic year 1964-65 to eliminate those of the AES curriculum. Most of the remaining service courses, primarily scheduled by Agricultural Education majors, were renumbered and reduced from five to three hours of credit. Agricultural Education majors could then enroll in five, three-hour courses rather than three, five-hour courses and thus receive broader instruction in agricultural engineering. However, the net result was more often a total of only nine hours. Additional breadth came with three new courses in the area of food technology, cooperatively administered with the Dairy Technology Department.

In 1967, the department commenced the second major revision, this time to comply with the College of Engineering change to a 4-year program. The opportunity for initiating new courses was not wasted; this most recent curriculum includes courses on modeling, biometeorology, and physical properties. This last area was given special support by a National Science Foundation grant in 1969 to help purchase a universal testing instrument.

Approved in 1963, the new PhD program in the department greatly expanded graduate teaching and research activities. By 1964 fifteen graduate students were working toward the PhD and M. Y. Hamdy was awarded the first departmental PhD at the end of 1965. The number of graduate students reached thirty-two in 1965, of which eighteen were pursuing PhD programs.

Two books published in 1966 were the second edition of Dr. Glenn Schwab's "Soil and Water Conservation Engineering," and "Corn Harvesting" by W. H. Johnson and Benson Lamp. In 1963, Dr. Carlton Johnson published "Farm Shop Plans and Student Notebook."

Student Branch and Alpha Epsilon. A major blow to the money-making efforts of the Student Branch of the ASAE came in 1960 when the College of Agriculture and Home Economics voted to discontinue Farm and Home Week; this move meant the end of the famous ASAE lunch stand. Three lean years followed this action, but then a new event in 1963, The Farm Science Review, gave the student members the opportunity to provide the exhibitors and visitors with sandwiches and soft drinks, and the students were in business once again.

The year 1960 was a memorable one for the Ohio State Student Branch of the ASAE, for this branch, in conjunction with the Annual ASAE Meeting held at Columbus, was host to the National Council of ASAE Student Branches. Furthermore, one Ohio State student, Robert Hansen, was elected president of the National Council of Student Branches, and another, George Merva, took top honors in the Student Paper Award Competition.

A new tradition was begun by the Student Branch in the Spring of 1966 when they invited their parents for an open house in Ives Hall and an evening banquet. This activity has been repeated each Spring Quarter.

In 1967, the ASAE Student Branch won Class B first place in the Farm and Industrial Equipment Institute National Contest with a score of 94.2 points out of 100. In 1968, and again in 1969, the Branch repeated its victory by winning first place in the Class B FIEI competition. In 1968, Richard Fegley was elected 2nd vice-president of the NCSB and Allen Zimmerman was presented the Student Honor Award and plaque for his scholarship and participation in student activities. In May, 1969, Richard Stroshine was the first recipient of the John G. Sutton $100 award, an honor to the outstanding third-year Agricultural Engineering Student in the United States.

During the academic year 1964-1965, the Ohio Iota Chapter of Alpha Epsilon, the agricultural engineering student honorary fraternity, was established on the Ohio State University campus.

Research. With the research staff settled in their new facility at Wooster, the period 1960-70 saw substantial growth in research, as well as administrative changes that influenced the department's program. Dr. Roy M. Kottman succeeded L. L. Rummell as Director in 1960, and Dr. Stewart, with a background in basic research was appointed departmental chairman in 1961. The initiation of the PhD program under Dr. Stewart's leadership expanded the possibilities for research through PhD candidates. In 1965, the name of the institution at Wooster was changed from the Ohio Agricultural Experiment Station to the Ohio Agricultural Research and Development Center to reflect more accurately the nature and scope of the institution's research activities.

To realize the varied research efforts of the department, one might turn to the ASAE Journal and Transactions for one year to see what was being published. In 1967, for instance, W. H. Johnson and James E.Henry were making planting studies and reported on the "Response for Germinating Corn to Temperature and Pressure." James Henry was also the author of one article, "Effect of Soil Strength on Corn Root Penetration." Work on the analog computer by M. Y. Hamdy, R. E. Stewart, and W. H. Johnson brought about a "Theoretical Analysis of Centrifugal Threshing and Separation." Also in the field of power and machinery, Professor S. G. Huber wrote, "Depreciation and Repair Costs of Self-Propelled Combines."

With researchers Snyder and Hall, Warren L. Roller reported a study on the "Coefficients of Kinetic Friction of Wheat on Various Metal Surfaces." He also presented in 1967, "Reproductive Performance of Swine in Controlled Warm Environments," a study performed in a major addition to the research facilities at Wooster, the Animal Environmental Laboratory.

The flow of colloidal suspensions in porous media was studied by R. Bruce Curry, and one of his articles published in this year was "Colloid Movement in a Flowing Medium with an Impressed Electrical Field." A study in drainage by Glenn O. Schwab and James Fouss was "Tile Flow and Surface Runoff from Drainage Systems with Corn and Grass Cover." Melville Palmer stressed "Water-Quality Improvement Programs in Ohio," while E. Paul Taiganides was surveying "Farm-Waste Management in Europe and India." And finally, John Blaisdell of the department reported in this 1967 edition on the "Flow Properties of Fluid Milk Products."

The new Slow Moving Vehicle Emblem (SMV) developed by K. A. Harkness in 1963, brought considerable acclaim to the department. This emblem was recognized as a distinct factor in reducing the number of accidents involving agricultural machinery on public highways and the emblem has been specified by ordinance in many states and provinces of the United States and Canada.

The agricultural pollution studies initiated by Paul Taiganides were heavily funded by federal agencies, leading to construction and equipping in 1968 of the Agricultural Pollution Control Research Laboratory in Ives Hall and an active graduate research program.

Extension. In the extension work of this period, many of the programs were tied to the research developments. In 1960, for instance, a minimum tillage program was carried out with demonstration plots being established in nine counties. To emphasize high quality hay through good hay handling and drying practices, forage crop institutes were held in various sections of Ohio. And in 1963 work on swine production in the Wooster facilities led to a state workshop on environmental control in swine production for extension agents, vocational agricultural teachers, power suppliers and equipment manufacturers. Studies of corn and soybean harvesting losses were conducted from 1964 through 1967, and showed that there was a need for improved machine adjustment and operation. In 1966 a new 16 mm color film, "How to Prevent Corn Harvesting Losses," was produced for extension work, and in 1968 a new bulletin, "Corn Harvesting and Handling and Marketing," helped to disseminate the vital information.

A growing recognition of the quality of extension activities is reflected in the number of ASAE Blue Ribbon Awards won during the 60's. Of a total of fifteen such awards, eleven were received in the last three years.

The Farm Science Review was begun in 1963, and the extension faculty had an active part in it. A farm pond and vacation cabin were built in a conservation demonstration area on the east side of Don Scott Field. About seventy Ohio farm machinery dealers were invited to a special program at the site where research and demonstrations on tillage, power and traction were discussed.

Other extension work ranged from giving advice on the engineering problems of harvesting soybeans to conducting fire and arson schools for firemen, arson investigators and related personnel.

International. Departmental participation in the USAID program in India, begun in 1957, continued through the 60's. Further, a Ford Foundation grant of $650,000 in 1964 initiated intensive departmental involvement in the development of the College of Agricultural Engineering at Punjab Agricultural University, Ludhiana, Punjab, India. Dr. Stewart became project director and many of the faculty served one or more periods as consultants at Ludhiana.

S. G. Huber, the first departmental representative, went to India in late 1964 for six months.

A contract between the OSU College of Agriculture, USAID, and the College of Agriculture of the University of São Paulo, Brazil, commenced in 1964. F. L. Herum served as the agricultural engineering member of the College group in Brazil from 1964 to 1966.

Table 1 lists departmental staff who have served overseas from 1963 to 1970 with locations and approximate periods of duty.

Table 1. Department Faculty Who Served on International Assignments Since 1963. Except where it is otherwise noted, these were in India.

Department	1963	1964	1965	1966	1967	1968	1969	1970
D. M. Byg*	xxxxxxxxxxxx							
R. E. Stewart	x		x		x[3]			
S. G. Huber		xxxxxx						
B. L. Bondurant			xxxxxxxxxxxxxx			x	xxxxxxxxxxx	
F. L. Herum		xxxxxxxxxxxxxxx[3]						
G. O. Schwab			xx					
W. H. Johnson					xxxxxxxxx			
H. J. Barre				xx	xx			
R. C. Reeve				x	x[1]	x[2]		
E. P. Taiganides				xx			x[4]	
M. L. Palmer					xx			
L. O. Drew						xxxxxxxxxxxxxxxxxxxxxxxx		
L. L. Harrold							xxx[1&4]	
R. B. Curry							xx	

[1]Turkey [2]Mexico [3]Brazil [4]Europe

*USAID - Udaipur 1958-64

Dr. C. M. Jacob, Dean of the College of Agricultural Engineering and Dr. B. S. Pathak, Head of the Department of Agricultural Engineering at Punjab Agricultural University, each spent three months in Columbus in 1968 studying our educational system. The first faculty member from Punjab Agricultural University to come to Columbus for an advanced degree under the Ford Foundation program was Mr. O. P. Gulati, in September, 1965.

Cooperative Research with Agricultural Research Service. Cooperative agreements, between the department and two separate groups of the Agricultural Research Service of the United States Department of Agriculture, were gradually formed since the 1940's and lead to joint research activities in this last decade.

Studies at the USDA Hydrologic Station, Coshocton, were completely integrated into the departmental program when L. L. Harrold was appointed to the faculty in 1962; cooperation between the SWC, OAES, and OSU had begun about 1940. This watershed research station provides a laboratory for studies by undergraduate and graduate students of OSU.

Beginning with J. L. Fouss and N. R. Fausey, a cooperative drainage materials and methods project was begun in 1960, based upon earlier research by G. O. Schwab. Until 1964 the studies concentrated upon a search for durable linings for mole drains and plow-type installation. R. C. Reeve joined the group as its leader in 1964, broadening its scope into water management. Augmented by L. S. Willardson, 1965-7, and J. R. Hoover, 1968-9, this group established the feasibility of corrugated plastic drain-tubes installed to grade by laser-controlled equipment. For his part in this activity, J. L. Fouss was awarded the ARS "Outstanding Performance Award" in 1968. This group is headquartered in Ives Hall.

With the completion of the research facilities at Wooster, personnel assigned to Pesticide and Equipment Research, ARS became more closely associated with the departmental research program. Frank Irons was investigation leader until 1965. Under his direction work on equipment for application of chemicals to control soil pests and the determination of spray patterns of agricultural sprayers was accomplished by O. K. Hedden. Also, basic studies of the translocation and deposit of pesticide particles were made by R. D. Brazee, with the help of a newly designed Flying-Spot Particle Analyzer. With the retirement of Frank Irons in 1965, O. K. Hedden became the investigation leader until his retirement in 1969. Mr. D. L. Reichard was a member of the staff from 1966 to 1969.

In 1962 the United States Department of Agriculture established the Pioneering Laboratory on Fine Particle Physics at the departmental research building at the OARDC in Wooster. R. D. Brazee was named to lead this project with R. D. Fox joining in 1968. Major research emphasis of the Laboratory has been the development of systems for measuring and analyzing turbulence and turbulent dispersion of fine particles in the atmosphere and within crop canopies.

Thus we come to the end of the initial century of The Ohio State University, charting the development and evolution of the Department of Agricultural Engineering and its contribution to the agricultural industry. But it is also the beginning of a second century, for which the first portends a bright future of activities and events which lie ahead.

APPENDIX A

Roster of

FACULTY

in

AGRICULTURAL ENGINEERING

The Ohio State University

1873-1970

FACULTY

in

AGRICULTURAL ENGINEERING

1873 - 1970

Roderick D. Barden	Prof. & Chairman	1924-1960	
Henry J. Barre	Professor	1962-	
Kenneth V. Battles	Professor	1936-1965	(Deceased 1965)
N. Robert Bear	Ext. Specialist	1927-1933	
Robert C. Belt	Instructor	1967-	
John L. Blaisdell	Ass't. Professor	1964-	
I. P. Blauser	Assoc. Professor	1928-1962	(Deceased 1964)
Joseph D. Blickle	Professor	1929-1930 1944-	
Byron L. Bondurant	Professor	1964-	
Ross D. Brazee	Professor	1960-	
Delbert M. Byg	Assoc. Professor	1947-	
R. Bruce Curry	Professor	1960-	
Leland O. Drew	Assoc. Professor	1968-	
Robert L. Erwin	Ass't. Agr'l. Engr.	1947-1948	(USDA)
Norman Fausey	Instructor	1969-	(USDA)
James L. Fouss	Instructor	1963-	(USDA)
Robert D. Fox	Ass't. Professor	1968-	(USDA)
William E. Gill	Assoc. Professor	1939-41 1948-	
Harris M. Gitlin	Ass't. Agr'l. Engr.	1946-1949	
Truman Goins	Ass't. Agr'l. Engr.	1950-1960	
James B. Green	Ass't. Professor	1917-1923	
Glenn E. Hall	Ass't. Professor	1960-1968	
Mohamed Y. Hamdy	Assoc. Professor	1966-	
Robert C. Hansen	Ass't. Instructor	1962-1963	
Kenneth A. Harkness	Instructor	1955-	
Lloyd L. Harrold	Professor	1962-	(USDA)
Orve K. Hedden	Professor	1962-1969	(USDA)
James E. Henry	Ass't. Professor	1952-	
Floyd L. Herum	Assoc. Professor	1964-	
Ronald D. Hill	Instructor	1960-1963	
Paul R. Hoff	Instructor	1927-1928	
Robert G. Holmes	Instructor	1963-1965	
Samuel G. Huber	Professor	1946-1954 1956-	
John D. Hummell	Instructor	1950-1953	
Homer T. Hurst	Instructor	1951-1955	

Frank Irons	Professor	1960-1965	
Frederick W. Ives	Prof. & Chairman	1914-1924	(Deceased 1924)
Carlton E. Johnson	Professor	1955-	
William H. Johnson	Prof. & Assoc. Chmn.	1948-	
W. A. Junnilla	Ass't. Professor	1940-1946	
Harold M. Keener	Instructor	1968-	
A. C. Kennedy	Professor	1937-1954	(Deceased 1966)
Cernyw K. Kline	Ass't. Professor	1951-1954	
Benson J. Lamp	Assoc. Professor	1949-1960	
Robert J. McCall	Instructor	1941-1942	
Glenn W. McCuen	Prof. & Chairman	1915-1956	
H. E. McLeod	Professor	1962-1964	
John T. Mercer	Instructor	1959-1961	
Richard C. Miller	Professor	1916-1917	1930-1962
Roger A. Miller	Assoc. Professor	1956-	
Wendell P. Miller	Instructor	1920-1924	
Gordon L. Nelson	Prof. & Chairman	1969-	
Byron L. Nolte	Instructor	1966-	
David A. Norman	Instructor	1967-	
J. Carroll Notestine	Instructor	1963-1964	
Virgil Overholt	Professor	1915-1956	
Melville L. Palmer	Assoc. Professor	1955-	
Donald L. Pfost	Instructor	1963-1968	
Percival B. Potter	Ass't. Prof.	1916-1928	
Harry C. Ramsower	Prof. & Chairman	1908-1920	(Deceased 1968)
Russell R. Raney	Instructor	1962-1965	
Chester O. Reed	Professor	1922-1940	(Deceased 1940)
Ronald C. Reeve	Professor	1964-	(USDA)
C. B. Richey	Ass't. Professor	1941-1943	
Warren L. Roller	Professor	1955-	
George S. Sanders	Instructor	1951-1952	
William R. Schnug	Ass't. Professor	1958-	
Glenn O. Schwab	Professor	1956-	
Larry J. Segerlind	Instructor	1964-1965	
George R. Shier	Ext. Specialist	1936-1943	
Ted H. Short	Ass't. Professor	1969-	
Edward A. Silver	Professor	1925-1944	
C. Edwin Smith	Instructor	1946-1949	
Benton M. Stahl	Instructor	1924-1928	
Albert G. Story	Ass't. Instructor	1963-1965	
Robert E. Stewart	Prof. & Chairman	1961-1968	
Wilbur E. Stuckey	Professor	1955-	
E. Paul Taiganides	Professor	1965-	
Robert R. Thompson	Ext. Specialist	1920-1924	
Harold P. Twitchell	Ext. Specialist	1920-1933	
Robert J. Walker	Instructor	1969-	
Dwight F. Warner	Instructor	1946-1959	
Richard K. White	Ass't. Professor	1970-	
Lyman Willardson	Instructor	1965-1967	(USDA)

APPENDIX B

Roster of

GRADUATES

in

AGRICULTURAL ENGINEERING

The Ohio State University

1911-1969

Degree Legend:

BSc	-	Bachelor of Science in Agriculture
BAE	-	Bachelor of Agricultural Engineering
BAE-MSc	-	Combined Bachelor of Agricultural Engineering and Master of Science in Agricultural Engineering
MSc	-	Master of Science in Agricultural Engineering
PhD	-	Doctor of Philosophy

1911
Hedge, J. C. - BSc

1915
Kennedy, Arthur C. - BSc
Smith, Arthur H. - BSc

1916
Klinck, Merle S. - BSc
McCuen, G. W. - BSc

1917
Baker, Allen L. - BSc
Overholt, Virgil - BSc

1919
Howenstein, James A - BSc
Silver, Edward A - BSc

1920
Graham, John K. - BSc
Kreitler, C. W. - BSc
Studebaker, Samuel S. - BSc
Weaver, David S. - BSc

1921
Balliet, Donald D. - BSc
Beem, Nelson - BSc
Booher, Harry - BSc
Carey, Loren D. - BSc
Cunningham, Paul M. - BSc
Erskine, Wallace S. - BSc
Ferguson, William S. - BSc
Hedge, Alfred M. - BSc
Hienton, Truman E. - BSc
Patten, William F. - BSc

1922
Bear, Norman R. - BSc
Beerbower, Ralph I. - BSc
Crumley, William A. - BSc
Keyser, Orman R. - BSc
McCollister, Francis G. - BSc
Peterson, Albert F. - BSc
Timmons, George W. - BSc
Twitchell, H. P. - BSc

1923
Barden R. D. - BSc
Craig, W. - BSc
Durbin, Clark B. - BSc
Everett, J. E. - BSc
Glendenning, A. - BSc
Heilman, Calvin - BSc
Koontz, Luther H. - BSc
Kramer, William R. - BSc
Kreitler, Robert K. - BSc
Miller, Floyd J. - BSc
Morgan, Ben - BSc
Smith, F. S. - BSc
Taylor, Francis P. - BSc
Wilcox, W. M. - BSc

1924
Behemyer, Roscoe C. - BSc
Belknap, Sherman J. - BSc
Burras, Arthur L. - BSc
Dill, Lee H. - BSc
Irons, Frank - BSc
Kaiser, Louis B. - BSc
Kauble, Harry - BSc
Long, Orville - BSc
Rinear, Louis - BSc
Young, E. K. - BSc

1925
Coppock, Guy - BSc
Cupp, Edwin M. - BSc
Frantz, S. P. - BSc
Harper, Wesley A. - BSc
Morehead, Lewis B. - BSc
Oberlin, Russell W. - BSc
Pollock, Calvin - BSc
Potter, Levere M. - BSc
Shepard, Edison - BSc
Springer, G. H. - BSc
Wileman, R. H. - BSc

Department Graduates (Cont.)

1926
Battles, Kenneth V. - BSc
Bovee, Rev. Perry - BSc
Drewes, George H. - BSc
Isler, David A. - BSc
Merry, Rufus E. - BSc
Palmer, Ralph - BAE
Romig, T. D. - BSc
Senseman, Maynard - BSc
Smith, Franklin C. - BSc
Snider, P. E. - BSc
Teegardin, Paul W. - BSc
Violet, Charles - BSc

1927
Gisler, Ralph - BSc
Green, W. S. - BSc
Greenlar, Maxwell - BSc
Griffin, Hoyle C. - BSc
Martin, Albert - BSc
Meachom, Howard - BSc
McKitrick, J. L. - BAE
Miller, Wilbur A. - BSc
Prickett, L. C. - BAE
Smith, W. F. - BSc

1928
Burras, G. E. - BSc
Foltz, Ralph M. - BSc
Hoff, Paul R. - BSc
Reese, Ellis - BSc

1929
Andrus, Howard - BSc
Bangham, Charles J. - BSc
Blickle, J. D. - BSc
Boyer, Jay L. - BSc
Easton, Arthur - BSc
Garver, Lester W. - BSc
Henderson, G. E. - BSc
Holliday, Lawrence L. - BSc
Hosbrook, Lawrence - BSc
Kurtz, Lloyd - BSc
Miller, Clarence A. - BSc
Pullman, G. H. - BSc
Richards, Robert - BSc
Young, R. A. - BSc

1930
Brubaker, L. G. - BSc
Dickey, Dwight R. - BSc
Haighler, R. C. - BSc
Reighard, Alfred R. - BSc
Romshe, Howard - BSc
Shipman, R. C. - BSc
Tucker, Leo B. - BSc
Teegardin, Frank - BSc
Walker, F. L. - BSc

1931
Clift, H. T. - BSc
Metz, Ralph W. - BSc
Zielke, A. F. - BSc

1932
Barre, Robert C. - BSc
Carrell, James W. - BSc
Cleland, Lee M. - BSc
Glenn, Bernard F. - BSc

1933
Arthur, Leland - BSc
Carr, Richard L. - BSc

1934
Powell, Wayne C. - BAE
Ryerson, G. E. - BAE
Schober, Wayne E. - BAE

1935
Hill, Stanley E. - BSc
Pinches, Harold - BAE
Schlotterback, Charles - BSc

Department Graduates (Cont.)

1936

Hedge, Clay B. - BSc
Hossler, Paul - BSc
Loiselle, Paul A. - BAE
Meeks, Shafor, BSc
Searfoss, Paul L. - BSc
Vance, Heber G. - BSc

1937

Agnew, C. M. - BSc
Bishop, R. W. - BSc
Bruns, Herold F. - BSc
Culp, Chester, F. - BAE
Elliott, Stanley M. - BAE
Gearhart, George H. - BAE
Martin, Myron W. - BSc
Parrish, John W. - BAE
Sayers, Homer K. - BSc
Seever, Charles F. - BSc
Washburn, Darvis E. - BSc
Young, Curtis J. - BSc

1938

Beatty, James C. - BSc
Gill, William E. - BSc
Hootman, Charles E. - BSc
Manchester, John H. - BSc
Rofkar, Paul H. - BSc
Royle, Gordon - BSc
Yoder, Fred - BAE

1939

Beales, Wendell L. - BSc
Duckworth, Doyle D. - BSc
Foltz, Glenn H. - BSc
Krill, Edwin J. - BSc
Lye, James G. - BSc
Main, Robert V. - BSc
Manchester, Crosby - BSc
Nelson, Earl C. - BSc
Overmyer, Lowell D. - BAE
Peterson, W. R. - BAE
Rofkar, Paul H. - BAE
Royle, Gordon - BAE
Steele, Richard E. - BSc
Tanger, Charles - BSc
Woods, William S. - BSc

1940

Allen Reid - BSc
Burkhardt, Michael M. - BSc
Connolly, Chancey C. - BSc
Crabbe, Julian B. - BSc
Haise, Howard R. - BSc
Hartsock, Robert E. - BAE
Howard, Vernon R. - BSc
Owen, Ferris S. - BSc
Peak, Charles - BSc
Robinson, Cecil H. - BAE
Shull, Arthur W. - BSc

1941

Bacon, Raymond - BSc
Baker, Robert S. - BSc
Baum, John A. - BAE
Berns, Henry E. - BSc
Brown, John Alvin - BAE
Carr, Ethbert S. - BSc
Deeds, Franklin H. - BSc
Doty, Julius - BAE
Erwin, Robert L. - BAE
Freeman, Dick R. - BAE
Funk, W. W. - BSc
Gitlin, Harris M. - BAE
Hastings, Stephen - BSc
Holton, Alice C. - BSc
Hoover, Robert L. - BSc
Huber, Samuel G. - BAE
Lowthian, James C. - BSc
McCall, R. J. - BAE
Miller, Edwin L. - BAE
Miller, Glenn R. - BSc
Miller, Roy D. - BAE
Parry, Thomas M. - BSc.
Peak, Charles - BAE
Spetka, Edward A. - BSc
Swack, Morris - BSc

Department Graduates (Cont.)

1942

Gault, Wayne C. - BSc
Hedge, John F. - BSc
Kavanagh, Joseph J. - BAE
Keep, Richard - BAE
Morrison, Charles S. - BAE
Mowls, Herman L. - BSc
Patterson, Ralph E. - BAE
Perry, C. A. - BSc
Pottenger, Thomas A. - BSc
Riegel, Paul F. - BSc
Ryder, Gordon J. - BSc
Whitacre, Eugene R. - BSc
Wolfe, Harry W. - BSc

1943

Carroll, Ray - BAE
Geiger, Harold L. - BAE
Gorby, Paul R. - BSc
Karath, Edward A. - BSc
Kimball, Stanley B. - BSc
McCormac, Billy M. - BSc
Memerever, Willy J. - BSc
Postle, Edwin E. - BSc
Reigert, Hubert J. - BSc
Rethmel, Frank E. - BSc

1944

Nemerever, Willy J. - MSc

1945

Ortega, Emilio A. - BSc

1946

Brown, Richard T. - BAE
Caudy, Joe S. - BSc
Fishman, Aryei - BSc
Warner, Dwight - BAE
Wren, Homer M. - BAE

1947

Barker, Robert O. - BSc
Bingham, C. Howard - BAE
Blackburn, Robert E. - BSc
Campbell, Lowell E. - BAE
Christen, Thomas P. - BSc
Feller, Lyle - BSc
Harper, Charles L. - BSc
McNinch, Ralph W. - BSc
Mitchell, Lester Jr. - BSc
Phillips, Ross A. - BAE
Salva, Milan E. - BAE
Schran, Jack R. - BAE
Sites, Arthur E. - BSc
Smith, Charles E. - BAE
Snider, Graydon - BSc
Veres, Stephen L. - BSc
Walker, Clyde B. - BSc
Wineland, Robert - BAE

1948

Aeschliman, Harold E. - BAE
Anderson, John R. - BSc
Baker, Eugene D. - BAE
Beckwith, Roger S. - BSc
Bhatmagar, Suresh C. - MSc
Buss, Harold H. - BSc
Canfield, Calvin H. - BSc
Case, Paul W. - BSc
Coomer, James W. - BSc
Correll, Stanley J. - BSc
Doolittle, Melvin K. - BSc
Dougan, Riley S. - BSc
Eby, John H. - BAE
Garber, Maurice E. - BSc
George, Earl F. - BSc
Gilbert, Ernest G. - BSc
Glass, Robert R. - BSc
Hall, Carl W. - BAE
Hector, Frank A. - BSc
Johnson, William H. - BAE
Jones, William L. - BSc
Kellogg, Norman D. - BSc
King, Dwight B. - BSc
Long, Phillip W. - BSc
Maddox, Robert L. - BSc
Mathiott, Harold B. - BSc

Department Graduates (Cont.)

1948 (Cont.)

Oatney, Richard D. - BSc
Perry, John S. - BAE
Robinson, Robert N. - BAE
Sharp, John W. - BSc
Stewart, James W. - BSc
Snively, Ross C. - BSc
Stoneburner, Paul W. - BAE
Tyler, George F. - BSc
Williamson, L. H. - BSc
Wilson, Clyde L. Jr. - BAE
Wilson, Raymond - BAE
Walvaared, Roger C. - BSc

1949

Bondurant, Byron L. - BSc
Brooks, George R. - BAE
Coyle, Charles J. - BAE
Culbertson, Walter - BSc
Davidson, William M. - BSc
Farmer, Clarence O. - BSc
Garn, Robert R. - BSc
Gilbert, Richard M. - BSc
Gray, Ralph E. - BSc
Hiel, Richard J. - BSc
Harbage, R. P. - BAE
Hartsock, James G. - BAE
Hoover, William O. - BSc
Imperial, Lee - BAE
Kallay, William S. - BSc
Kinnear, Robert B. - BAE
Koch, Willard H. - BSc
Lachey, Fred - BSc
Lamp, Benson J. Jr. - BAE
Lichtensteiger, Frederick M. - BSc
Manfull, George E. - BSc
McConeghy, George - BSc
Mock, Lee B. - BSc
Newberger, George J. - BSc
Poulson, George E. - BSc
Reeser, Robert M. - BSc
Robinson, Robert C. - BAE
Roush, Dale K. - BSc
Schnelzer, George L. - BSc
Smith, Clarence J. - BSc
Strobel, Lewis Jr.- BSc
Waine, Robert K. - BSc
Wilson, Charles - BAE
Yarrington, Paul T. - BAE
Warner, Mardis R. - BAE

1950

Andrews, Vern H. - BSc
Asmus, Roger - BSc
Aiken, Clifford D. - BSc
Allman, Dwight E. - BSc
Brown, David L. - BAE
Burdick, Gleason A. - BSc
Campbell, Richard H. - BSc
Cheek, Eugene E. - BSc
Clemens, Robert A. - BAE
Coe, Don A - BSc
Connally, Julian E. - BSc
Conard, Donald - BSc
Cooper, Noel R. - BSc
Coy, Glenn - BSc
Crothers, William R. - BSc
Crown, Richard E. - BAE
Dubarry, George D. - BSc
Emert, Lee M. - BSc
Evans, Robert C. - BAE
Fast, Robert E. - BSc
Fogt, Carl F. - BSc
Hahn, William S. - BSc
Hart, Leslie G. - BSc
Hartsock, Robert E. - BSc
Hoffman, Oscar W. - BSc
Holdren, Robert F. - BSc
Hummel, Gene M. - BAE
Hurst, Homer T. - BAE
Johnson, James E. - BSc
Kappus, Walter E. - BAE
Keough, Paul G. - BSc
Kramer, Eugene T. - BSc
Klooz, Paul C. - BAE
Krill, Cleon D. - BSc
Lamborn, Charles F. - BAE
Lapp, Ellsworth W. - BSc
Lipp, Harold C. - BAE
Lowmiller, Kenneth E. - BSc
Matthews, Donald R. - BSc
Meyer, Stanley P. - BSc
Morr, Ralph V. - BAE
Myers, Roger E. - BSc
Riehl, George E. - BSc
Sanders, George - BAE
Schaaf, Henry W. - BAE
Simpson, Richard - BSc

Department Graduates (Cont.)

1950 (Cont.)

Steck, William A. - BSc
Tillman, Robert W. - BAE
Ulery, Wilbur D. - BSc
Utz, Robert F. - BSc
Walker, Jack E. - BSc
Wolfer, Kenneth R. - BSc
Wood, William A. - BAE

1951

Abele, Richard D. - BAE
Acker, Jack F. - BAE
Ackley, John W. - BAE
Armstrong, Lowell E. - BSc
Bartenes, Phillip E. - BSc
Bash, Robert E. - BSc
Beerbower, Loring - BSc
Beery, Neal C. - BSc
Bradfute, John H. - BSc
Brooks, Joseph H. - BSc
Brown, Arlo J. - BSc
Bullard, Arthur R. - BSc
Carpenter, Jack E. - BSc
Ceter, Ralph W. - BSc
Chaffe, Arthur W. - BSc
Detrick, Andrew G. - BAE
Dunlap, Howard C. - BSc
Fenton, Richard S. - BAE
Fleet, Alvern R. - BSc
Geiger, Meredith L. - BAE
Hahn, Charles L. - BAE
Hellwig, Robert E. - BAE
Hickman, James W. - BSc
Hoke, Richard W. - BAE
Huffman, Paul R. - BAE
Koppenhaufer, Arthur C. - BSc
Kreglow, James A. - BSc
Leedy, Dean - BSc
Leonard, William - BAE
Marks, Joseph D. - BAE
McCoy, Glenn G. - BAE
Medley, Jackson C. - BAE
Metzger, Arnold J. - BAE
Michener, Edwin - BSc
Milburn, Wendell R. - BAE
Miller, James B. - BAE
Motahari, A.H.M. - MSc
Mutchler, Calvin K. - BAE
Patzer, Neil - BAE
Rath, Thomas L. - BSc
Roberts, Edgar H. - BSc
Roof, K. Dale - BSc
Salva, Laddie G. - BAE
Sarr, Clair L. - BSc
Saveson, Irvin L. - BAE
Schmidlapp, William - BSc
Schnug, William R. - BAE
Schran, Gene E. - BSc
Sperry, Donald B. - BSc
Stackhouse, John M. - BSc
Stillwagon, Walter L. - BSc
Stoltz, Robert W. - BSc
Thomas, Kenneth R. - BAE
Tomlinson, Wilbur C. - BSc
Utz, John P. - BSc
Wagner, Thomas E. - BSc
Wills, Stanville Jr. - BSc
Yaney, Robert W. - BSc

1952

Alford, Richard H. - BSc
Chambers, Edward C. - BSc
Cosler, Raymond I. - BSc
Dennison, Jack E. - BSc
Detrick, Andrew G. - MSc
Downs, William J. - BSc
Dye, William L. - BSc
Foster, Eugene R. - BSc
Henne, Robert E. - BSc
Henry, James E. - BSc
Johnston, John A. - BSc
Judy, Ed - BAE
Kellogg, Charles W. - BAE
Koger, William H. - BAE
Lamp, Benson J. - MSc
Layton, Robert - BAE
LeCras, Edward G - BSc
Mercer, John R. - BAE
Miller, Edgar Jr. - BSc
Miller, Samuel A. - BSc
Morrison, John A. - BSc
Palmer, David B. - BAE
Pitzenbarger, Alva F. - BAE
Potter, Thomas A. - BSc
Prince, Norman W. - BSc
Pulse, Paul F. - BSc
Sarafin, James P. - BSc

Department Graduates (Cont.)

1952 (Cont.)

Shoup, Charles W. - BSc
Stader, William M. - BAE
Stallsmith, Charles W. - BSc
Starr, Charles G. - BAE
Sunderlin, John T. - BSc
Taylor, Gordon E. - BAE
Wagener, John - BSc
Young, Robert G. - BAE

1953

Booker, Walter W. - BAE
Cherry, William A. - BSc
Davis, Howard F. - BSc
Dayton, Raymond K. - BSc
Enterline, Henry M. - BSc
Frick, Myron H. Jr. - BSc
Hale, Howard H. - BSc
Harrison, Timothy A. - BAE
Hawkins, Kenneth H. - BAE
Hetzner, Lowell E. - BSc
Higginbotham, James A. - BAE
Hirth, Harry C. - BAE
Husted, Hugh C. - BSc
Jarmi, Robert E. - BSc
Johnson, William H. - MSc
Kimpton, Myron A. - BSc
Kipp, Carl E. Jr. - BSc
Krohn, Robert L. - BAE
Krupp, Giles H. - BSc
Lichti, Robert W. - BSc
Martin, Paul E. - BSc
Patterson, John A. - BSc
Potter, Donald R. - BSc
Rice, John I. - BSc
Richardson, Harvey H. - BAE
Sharp, Howard C. - BSc
Taylor, James L. - BSc
Wenig, Henry C. - BSc
Woodworth, Richard M. - BSc
Wylie, Charles A. Jr. - BSc

1954

Bross, John R. - BSc
Carnes, Ed - BSc
Clark, Roy A. - BSc
Crawshaw, James R - BAE
DeCoster, Rowan - BSc
Ecker, Donald R. - BAE
Faber, Henry M. - BAE
Goins, Truman - MSc
Hartsock, Robert E. - MSc
Hoes, Robert L. - BSc
Hornberger, Richard L. - BSc
Huddle, Robert M. - BSc
Kohlman, Emery H. - BAE
Leach, Allen P. - BSc
Lewellen, William - BAE
Litten, William D. - BSc
Michiner, Dwight W. - BSc
Mitchell, William H. - BSc
Mylander Richard H. - BSc
McIlvaine, Dali I. - BSc
McVicker, David S. - BSc
Neff, Robert A - BAE
Nelson, Edwin E. - BAE
Pond, Robert - BSc
Shively, Robert W. - BSc
Smith, Lyle W. - BSc
Spurrier, William W. - BSc
Thorburn, Carl L. - BSc
Tohm, Bruce E. - BSc
Wilson, David L. - BSc
Winkle, Roy, BAE
Youngpeter, Donald - BSc

1955

Bender, Leo H. - BSc
Carraher, Terrence L. - BSc
Drier, Alan C. - BSc
Fleet, E. Richard - BSc
Flory, Richard L. - BSc
Gettman, Thomas L. - BSc
Harper, James - BSc
Hause, Richard - BSc
Hazle, Hugh A. - BSc
Holcomb, Everette - BSc
Kidnocker, Dwight - BSc
Lang, Harvey R. - BSc
Laub, James S. - BSc
Lovingood, Miles H. - BSc
Lucke, Virgil H. - BSc
Miller, J. Dean - BAE
Miller, Walter - BSc
Palmer, Melville L. - MSc
Place, George W. - BSc
Rehmert, Martin - BSc
Simon, Robert A. - BSc
Thurston, David - BAE

Department Graduates (Cont.)

1955 (Cont.)

Uher, Joseph J. - BSc
Weigand, David K. - BSc

1956

Battles, John E. - BSc
Branco, Joseph C. - BSc
Brill, Donn - BSc
Clark, Louis - BSc
Clingerman, John L. - BAE
Cox, Max E - BSc
Crabbe, H. Kenneth - BSc
Emirli, Nejat - MSc
Frink, Richard D. - BSc
Garrett, John J. - BAE
Jones, Clarence - BSc
Kanas, William - MSc
Lantz, Zane L. - BSc
Leitzy, John D. - BSc
Longfellow, James - BSc
Merkle, Harold L. - BSc
Morton, Ted R. - BSc
Newman, Russell - BSc
Parlette, John - BSc
Wirth, Henry W. - BSc
Young, Willy K. - BSc

1957

Amerine, James D. - BAE
Augenstein, Edwin - BSc
Ball, Fred - BSc
Berrisford, Robert S. - BSc
Boos, Donald H. - BSc
Byg, D. M. - MSc
Cryder, John - BAE
Decker, James - BSc
Geckler, Calvin - BAE
Hoover, Gary N. - BSc
Jordan, Roland R. - BSc
Knell, Harvey A. - BAE
Lezotte, Harold R. - BAE
Lichti, Robert W. - BAE-MSc
Michael, Glen - BAE
Moyer, Don - BSc
McDaniel, Donald - BAE
Post, Donald E. - BSc
Reese, Cleland P. - BSc
Rhodes, Lynn - BSc
Schaller, Kenneth A. - BSc
Smith, Norman T. - BSc
Smith, Phillip C. - BSc
Sudman, James R. - BSc
Tressler, Theodore T. - BSc
Voneman, James H. - BSc
Walls, James T. - BAE
Yockey, Delmar L. - BSc
Zechman, Stephen S. - BSc
Zielke, Richard C. - BSc

1958

Asmus, Rodger - BAE-MSc
Coleman, William R. - BSc
Glick, David D. - BAE
Haughn, Larry A. - BSc
Heilman, Max - BSc
Hill, Ronald D. - BSc
Huber, Samuel G. - MSc
Huddle, John P. - BSc
Latham, Delbert K. - BSc
Lenart, Norman S. - BSc
Long, John - BSc
Longshore, Don - BAE
McLoda, Niles A. - BSc
Meng, James L. - BAE
Nag, Kedar N. - MSc
Pandya, S. S. - MSc
Ropp, George - BSc
Shafer, Edward B. - BSc
Writsel, Gordon - BSc

1959

Bullard, David E. - BAE-MSc
Burkey, Robert G. - BSc
Collins, Donald L. - BSc
Cooperider, Neil W. - BSc
Cuerington, Aaron M. - BAE
Dawson, Russell B. - BSc
Deane, Charles L. - BSc
Dwelle, William W. - BSc
Fairchild, Ned A. - BSc
Fouss, James - BAE
Gil, Luis, R. - BSc
Gissler, Randall W. - BSc

Department Graduates (Cont.)

1959(Cont.)

Hahn, Russell H. Jr. - MSc & BAE
Jones, Charles N. - BSc
Jones, Thomas B - BAE
Lindrooth, Charles D. - BSc
Lowmiller, George E. - BSc
Madden, Carl - BSc
Mitchell, Paul - BSc
Milbrandt, George J. - BSc
Sasey, Edward J. Jr. - BSc
Schott, Wilbur - BAE & MSc
Slates, Larry L. - BAE
Smith, William L. - BAE
Spillman, David F. - BSc
Teale, Robert E. - MSc
Uhl, James B - BAE
Wagner, Jerome E. - BAE

1960

Berlekamp, Rodney L. - BSc
Bodenbender, Harley G. - BSc
Bullard, David E. - MSc
Cox, Clarence L. - BSc
Cummins, David E. - BSc
DeCoster, Rowan B. - BAE
DeWeese, Donald - BSc
Dinan, Philip L. - BSc
Fink, Thomas - BSc
Fuhrer, Norman - BAE
Hahn, David - BSc
Hill, Ronald D. - MSc
Holdren, Richard D. - BAE
Hoover, Larry L. - BSc
Joehlin, Stanley - MSc
Jones, Mayford J. - BSc
Knicely, Paul - BSc
Kreider, David L. - BSc
Merva, George - BAE
Miller, J. Dean - BAE
Notestine, J. Carroll - BAE
Patterson, James - MSc
Pyle, Joseph - BSc
Rausch, David L. - BAE-MSc
Reno, Robert L. - BSc
Roy, B. S. - MSc
Scheblo, William, Jr. - BSc
Schulte, Robert - BSc
Slagle, John - BAE
Steiger, Joseph, BSc
Strawman, Lawrence A. - BSc
Thomas,Robert - BSc
Wachtmann, Ronald F. - BAE
Young, Paul - BAE
Zeigler, Jack B. - BSc

1961

Baker, Robert R. - BSc
Bent, Joslyn A. - BSc
Camper, David - BAE
Davis, Larry J. - BAE
Dietz, Frederick M. - BSc
Englehard, Paul H. - BSc
Freer, John J. - BAE
Giffin, Ewing A. - BSc
Goettemoeller, Robert L.- BSc
Greenlee, John E. - BSc
Heys, Edwin A. - BAE
Holt, Lee A. - BAE
Horn, David L. - BAE-MSc
Kerr, James W. - BSc
Knicely, David R. - BAE
List, David W. - BAE
Manges, John S. - BAE
Meyer, Lewis F. - BSc
Miller, James P. - BSc
McBride, J. Michael - MSc
McClure, Walter R. - BAE-MSc
Oehrtman, Robert L. - BSc
Overmyer, Edwin L. - BSc
Poplis, John A. - BAE
Rausch, David L. - MSc
Shaffer, James P. - BAE
Sheley, Glen A. - BSc
Smith, Roscoe E. - BSc
Specht, Glenn E. - BAE
Stuber, Paul R. - BAE
Troeger, John M. - BAE
Uhl, James B. - MSc
Waesch, James A. - BSc
Ward, Wayne D. - BSc
Wells, David S. - BSc
Winkleblech, Carl S. - MSc

1962

Aspinwall, James R. - BSc
Brough, Robert F. - BSc
Buchanan, James C. - BAE-MSc
Bullock, Robert G. - BSc
Colsch, Cecil J. - BSc
Cunningham, Martin V. - BSc

Department Graduates (Cont.)

1962 (Cont.)

Dwelle, Ray S. - BSc
Eckstein, Richard W. Jr. - BAE
Firebaugh, John D. - BAE
Fouss, James L. - MSc
Hagmaier, Rodger A. - BSc
Hanko, Norman J. - BAE
Hansen, Robert C. - BAE-MSc
Holmes, Robert G. - BAE-MSc
Hoot, Kenneth A. - BSc
Ireland, William - BAE
Latham, Ronald D. - BSc
Memmer, Fredrick - BAE
Michener, Dwight W. - BAE
Plummer, Paul M. - BAE
Schiermeirer, Walter W. - BSc
Shaffer, James P. - MSc
Streng, Carl R. - BAE
Wilson, Robert L. - BAE

1963

Bailey, Donald M. - BSc
Etzler, Alvin L. - BSc
Fulton, Thomas M. - BAE
Gastier, Theodore W. - BSc
Gebhart, Daniel E. - BAE-MSc
Grooms, James H. - BSc
Hahn, Charles - MSc
Hiler, Edward A. - BAE-MSc
Hoffman, Glenn J. - BAE-MSc
Jefferies, James E. - BSc
Jentes, Charles A. - BAE
Lee, Larry L. - BSc
Markland, Hans L. - BSc
McCoy, James S. - BSc
Osborn, James L. - BSc
Welsch, Donald E. - BSc
Wright, Clement O. - BSc

1964

Albert, John P. - BAE
Barker, Gary L. - MSc
Belt, Joseph H. - BSc
Belt, Robert C. - BAE
Binning, David R. - BSc
Bowers, Robert E. Jr. - BSc
Briner, Paul A. - BSc
Cole, Donald R. - BSc
Glenn, Theodore L. - BAE
Kissell, Arnold K. - BSc
Luth, Harold J. - BAE
Maddox. Melvin D. - BAE
Meyer, Roy L. - BAE
Mitchell, William E. - BAE
Nietz, Robert C.- BSc
Notestine, J. Carroll - MSc
Santoro, David S. - BAE
Ullery, Charles H. - BSc
Vorst, James J. - BSc
Zimmerman, Clair, S. - BSc

1965

Brainerd, John F. - BSc
Frederick, Charles V. - BAE
Hamdy, Mohamed Y. - PhD
Hansen, Wm. J. - BSc
Heller, Larry E. - BSc
Hocking, Daniel E. - BAE
Hoover, James R. - BAE
Jones, Ed R. - BSc
Pemberton, Clem J. - BSc
Rapp, Donald H. - BAE
Rohrbach, Roger P. - BAE
Short, Ted H. - BAE
Thuernau, Alan E.- BSc
Walker, Robert J. - BAE
Winegardner, Ross D. - BAE
Yochum, Edwin L. - BAE

1966

Baughman, Gerald R. - BAE
Hiler, Edward A. - Ph.D.
Jain, Mohan L. - MSc
Long, John D. - BAE-MSc
Michael, James W. - BAE
Schnug, Wm. R. - MSc
Short, Ted H. - MSc
Winegardner, Ross D. - MSc